

CHAPTER 3: AFFECTED ENVIRONMENT

This chapter describes those existing environmental and social conditions within the proposed Provo Canyon Highway Improvement Project Area (Project Area) (Figure 1-3) that have changed since the 1989 Supplemental Environmental Impact Statement (SEIS) (FHWA 1989a) or would change as a result of implementing the Project roadway realignment and reconstruction of the Wildwood to Deer Creek State Park and Deer Creek State Park to Heber Segments. Although most descriptions focus primarily on Wasatch County, where all construction would occur, some information for Utah County is presented if resources in that area (e.g., wildlife) would potentially be affected by these segments of the Project. As noted in Chapter 2, all segments of the Project below Wildwood have been completed (Figure 1-3) and thus are not addressed here.

Descriptions of the pertinent physical, biological, and social resources within the current Project Area are based on literature and data file searches; contact and coordination with local, State, and Federal agencies and personnel; field visits by resource specialists; and review of the 1989 SEIS (FHWA 1989a) and the 1995 Re-evaluation (BIO-WEST 1995). Those conditions are discussed below under each potentially affected resource component. As noted in Chapter 2, the haul road constructed in 1996 to transport fill material from the Upper Falls to Wildwood Segment lies within the 2002 Preferred Alignment corridor and has thus already generated and mitigated many of the impacts associated with the Project.

HIGHWAY RECONSTRUCTION: WILDWOOD TO DEER CREEK STATE PARK

Earth Resources

Topography

Between Wildwood and Deer Creek Dam, Provo Canyon is a narrow river canyon characterized by steep, mountainous terrain and rocky canyon walls. Slopes typically range from 10 to 50 degrees with steeper areas in some sections. Much steeper talus slopes dominate the east side of the Provo River, while less steep, grass- and sage-covered slopes characterize much of the west side of the river. Ridges and mountains to either side of the river canyon have elevations of about 2,100 to 2,700 meters (7,000 to 9,000 feet). The existing highway traverses a narrow bench located on the west side of the river, in some areas as close as 3 meters (10 feet), and gains elevation from about 1,585 meters (5,200 feet) at Wildwood to 1,650 meters (5,400 feet) near the dam. From Deer Creek Dam to Deer Creek State Park, the Project Area consists of a relatively broad grass-covered valley around Deer Creek Reservoir surrounded by low, rounded hills. The reservoir spillway level is 1,650 meters (5,417 feet), and the hills around the reservoir have elevations of about 1,800 to 2,100

meters (6,000 to 7,000 feet). The existing highway is located along the east side of the reservoir (FHWA 1989a).

From the dam to Heber City, the topography consists of a broad valley at an elevation of about 1,675 meters (5,500 feet). The valley is dominated by large, open stretches of land used for farming and grazing.

Faults

Provo Canyon is a geologically complex area that contains both thrust faults and normal faults. Normal faults fracture rocks only within a few feet of the fault zone. Thrust faults have a larger rock-shattering capability over a broader zone than normal faults, sometimes taking in an area from hundreds to thousands of feet wide. Shear zones for thrust faults are typically 0.6- to 1.5-meters (2- to 5-feet) thick, resulting in unstable rock slopes within 122 to 183 meters (400 to 600 feet) of the shear zone. However, faults can have a variable thickness and zone of deformation. Thrust faults are prevalent in the upper canyon, particularly in the Wildwood to Deer Creek State Park Segment. A portion of the Deer Creek thrust fault extends from Provo Canyon up through Canyon Meadows, arching northward then east and back south toward Deer Creek Dam. None of the faults in Provo Canyon are currently active (FHWA 1989a).

Slides

Slumps, landslides, and mudslides are naturally occurring components of Provo Canyon's geological history. The Hoover Slides are located in the upper canyon portion of the Project Area between Wildwood and Deer Creek Dam. The Hoover Slides extend over an area of Manning Canyon Shale bordered on the north by a segment of the Deer Creek thrust fault. It has been documented that these slides have been active for over 60 years. The Canyon Meadows development sits atop an ancient slide mass that makes up the older part of the Hoover Slides. While this portion appears to be stable, there are currently six active slides along the highway, three of which have plagued the existing roadway. The situation has been exacerbated over the years in locations where road fill has been placed on top of clayey material weathered from the underlying shale. The extra weight has resulted in the roadway continually slumping and pushing debris fans into the Provo River. This continual slide movement has required constant road maintenance with the repeated placement of additional layers of asphalt at several locations, over the full width of the roadway. Many of these slump areas are several hundred feet long, and in some areas, the asphalt is now up to 0.9 meters (3.0 feet) thick. Large cracks appear in the asphalt surface often within 2 months of application, providing further indication of continual slide movement (FHWA 1989, Shannon and Wilson 1989, Delta Geotechnical Consultants 1994, Parsons Brinkerhoff 1995).

A detailed geotechnical study of the area was conducted by Parsons Brinkerhoff as a part of the design of the Wildwood to Deer Creek State Park Segment. This analysis (Parsons-Brinkerhoff 1995) summarized all previous work in the area and provided the geotechnical basis for the Preferred Alternative and the current design. Because of continued public and local property owner concerns as to geotechnical design and stability, the State of Utah Department of Transportation (UDOT) contracted with Landslide Technology of Oregon to conduct an independent peer review

of the preliminary geotechnical design along the 2002 Preferred Alignment across the Hoover Slide area and to identify any significant geotechnical issues or concerns with the design. Their analysis (Landslide Technology 2001) additionally summarized the geotechnical knowledge of the area and design issues.

During construction of the Upper Falls to Wildwood Segment and the haul road, a substantial slide known as the “construction slide” occurred immediately above the Wildwood turnoff. The slide occurred during construction activities and resulted in a brief closure of the existing highway. Subsequent analysis and development of remediation plans indicated that the slide material is currently stable. The design and construction plans for the Wildwood to Deer Creek State Park Segment will include the removal and remediation of the slide area. A continual maintenance problem area, known as the “blue mud slide,” produces an irregular flow of mud onto the existing highway a short distance up-canyon from the construction slide, and it will also be remediated during construction in that segment.

In the area between Deer Creek Dam and Deer Creek State Park, an inactive surface slump about 27 meters (90 feet) wide is located in clayey alluvial material above the highway near the state park. An active slump about 18 meters (60 feet) wide and 46 meters (150 feet) long is located in clayey colluvium on the southwest edge of the reservoir opposite the highway. In the late 1980s this slump deposited several yards of soil onto the railroad tracks (FHWA 1989a). Additionally, there is an embankment failure located above the dam.

Snow Avalanches

In the Wildwood to Deer Creek State Park Segment, at least five avalanche chutes are present along the east side of Provo Canyon. Typically at least one snow avalanche occurs from one of these chutes each year and covers the highway or inundates the powerhouse area. Another small chute is located on the slope west of the existing roadway about 1,100 meters (3,700 feet) north of Wildwood (FHWA 1989a). As the result of design concerns associated with two major chutes near Deer Creek Dam, UDOT contracted with a nationally-known avalanche expert, Dr. David McClung of the University of British Columbia, to conduct an updated avalanche analysis of those chutes. His analysis (McClung 2001) suggested several design changes and validated portions of the existing design relative to public safety and highway operation, as noted in Chapter 2.

Water Resources

Existing watershed conditions in the Project Area have changed compared with those described in the 1989 SEIS (FHWA 1989a). Hydrological and water quality conditions within the Provo River, particularly within the Project Area, have been impacted dramatically by changes in water operations associated with Jordanelle Dam and Reservoir, which were constructed upstream from Deer Creek Reservoir in the mid 1990s. Because such impacts have been much more significant than the potential impacts that would result from implementing either the SEIS or the 2002 Preferred Alignment, it became impracticable to use the 1989 SEIS (FHWA 1989a) as baseline data for assessing current conditions. Therefore, different procedures were used for analyzing current water

resource conditions, as detailed in the Watershed Management Plan provided in the *Provo Canyon Scenic Byway Corridor and Watershed Management Plan* (BIO-WEST et al. 2000). That same information is included and summarized below.

Water resources in the Project Area are dominated by Deer Creek Reservoir and the Provo River. The river flows in a southwesterly direction from approximately 1,646 meters (5,400) feet above sea level near the dam to 1,463 meters (4,800 feet) above sea level near the mouth of the canyon. The Project Area encompasses the entire drainage areas (104.9 square miles) of Deer Creek, North Fork, South Fork, and all other tributaries that discharge to Provo River in the canyon. Peak elevations of the tributaries are as high as 3,350 meters (11,000 feet) above sea level in North Fork and over 2,800 meters (9,200 feet) in both Deer Creek and South Fork. Land uses in this watershed consist primarily of agricultural activities, new and old residential development with septic systems, high use recreation, roads, and active construction.

Average annual precipitation in the watershed ranges from 30 centimeters (12 inches) at Provo, near the mouth of the canyon, to 64 centimeters (25 inches) at Deer Creek Dam, to 112 centimeters (44 inches) at Sundance Ski Resort. Most of the precipitation comes in the form of snow during the winter months and melts/runs off during the spring and early summer months. Flows in the Provo River are regulated by operations of Jordanelle and Deer Creek Reservoirs. Although discharge rates are controlled by water operations, the typical hydrograph mimics a snowmelt-dominated hydrologic regime. In addition to the natural runoff of the Provo River basin, there are two transbasin diversions that import water into the basin above Jordanelle Reservoir. The first transbasin diversion comes from the Weber River near Oakley, Utah, and is discharged to the Provo River near Francis, Utah. The second transbasin diversion comes from the Duchesne River and is discharged into the Provo River approximately 23 kilometers (14 miles) upstream of Woodland. Minimum instream flows have been established in Provo Canyon by the Utah Division of Wildlife Resources (UDWR) to provide sustained habitat for aquatic species. Streamflow in the tributaries is unregulated and originates as high-elevation snow. The flow regimes of North Fork and Deer Creek are dominated by spring snowmelt runoff, with peak flows occurring earlier in the year on Deer Creek because of its lower elevation drainage. Flows are much more constant on South Fork, which is a spring-dominated system.

The 1998 R317-2 Standards of Quality for Waters of the State of Utah (UDWQ 1997) lists the Provo River and tributaries from Murdock Diversion to headwaters being protected for the beneficial uses shown in Table 3-1. Sections R317-2-14 and R317-2-7.2 provide numeric and narrative water quality standards to protect the beneficial uses of the Provo River. The Provo River is a major source of drinking water for residents along the Wasatch Front. Contamination of this drinking water source would likely cause health problems and would result in extensive water treatment costs. Provo River water is also used for agricultural and recreational purposes, and maintains a blue-ribbon trout fishery. Protection of the watershed and preservation of good water quality is important to maintain these beneficial uses.

Table 3-1. Designated Beneficial Uses of the Provo River.

PROVO RIVER AND TRIBUTARIES FROM MURDOCK DIVERSION TO HEADWATERS	
1c.	Protected for domestic purposes with prior treatment by treatment processes as required by the Utah Division of Drinking Water;
2b.	Protected for secondary contact recreation such as boating, wading, or similar uses;
3a.	Protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain; and
4.	Protected for agricultural uses, including irrigation of crops and stock watering.

The Soil Conservation Service soil survey for the area (SCS 1976) classifies the majority of the soils along the corridor as a fluventic haploboroll, a fluvial-process formed soil. Other soils include substantial amounts of loam, while unconsolidated material and rock outcrops are present in some areas.

Slopes along this section of the corridor vary considerably in steepness. Some areas have relatively gentle slopes, as low as 5 percent, while other areas are quite steep with slopes as high as 90 to 100 percent. Most slopes in the area fall between 20 percent to 60 percent. Some of the steepest existing slopes occur along the section of road immediately north of the dam face. This steepness gives way to more gentle slopes as the canyon becomes wider near Deer Creek State Park.

As noted previously, vegetation in the area consists mainly of shrubs and grasses with a few large clusters of trees. At the lower end of the Project Area, some areas are bare because of rock cuts, erosion, and slope failure; the vegetation here is also predominantly shrubs and trees. The area near the reservoir supports more-grassy vegetation types, but it also includes substantial numbers of shrubs and trees.

Few best management practices are currently in use in the Project Area to reduce sediment loads into the Provo River, which the existing highway closely follows. Many road ditches drain directly into the Provo River or into hillsides along the river.

Because of the extensive use of the Provo River for water supply and its relatively high erosion potential, water quality in the watershed and river has become a much larger concern than in the past. The Mountainlands Association of Governments (the local metropolitan planning organization) commissioned the *Provo Canyon Scenic Byway Corridor and Watershed Management Plan* (BIO-WEST et al. 2000) for the Provo Canyon Scenic Byway (US-189) in 2000. This plan is a non-binding document with the purpose of improving watershed conditions and controlling non-point source pollution in the watershed. Development of Total Maximum Daily Loads (TMDLs) for Total Phosphorus (TP) and Total Suspended Solids (TSS) was one objective of the plan, since these pollutants are often associated with excess erosion and sedimentation and are acknowledged to be of primary concern in the watershed. Although the Provo River is not on the State of Utah 303(d) list as impaired for either TP or TSS, TMDLs for these constituents were

created as a planning tool to protect and improve water quality by understanding and quantifying the relative contributions of these pollutants from various sources. An implementation plan does not exist for these TMDLs because they are simply components of this non-binding watershed management plan at this time. A wide array of Federal, State, and local agencies – including UDOT and Federal Highway Administration (FHWA) – participated in and agreed to support these goals.

Floodplains

Floodplains are areas inundated by storm water runoff. Encroachment into these areas reduces the flood carrying capacity, increases flood heights, and potentially increases flood hazards beyond the encroachment. In response to escalating costs to taxpayers for flood disaster relief, Congress established the National Flood Insurance Protection Program (NFIP). The NFIP is a voluntary mitigation program administered by the Federal Emergency Management Agency (FEMA). The program is based on an agreement whereby the Federal government makes flood insurance available to communities that practice sound floodplain management. This encourages State and local governments to develop and implement floodplain management programs.

The FEMA has undertaken identified and mapped Special Flood Hazard Areas (SFHAs) within communities. A SFHA is defined as an area with a 1-percent chance of being flooded in any given year, also known as a 100-year event. The 100-year river, stream, or lake flood can be defined as the flow rate and water level resulting from a 100-year storm event or the highest lake elevation that has occurred in a 100-year period. Development may take place within the identified SFHA if it complies with local floodplain management regulations that meet Federal requirements.

Areas of 100-year flooding occur along the banks of the Provo River, Daniels Creek, Snake Creek, Decker Creek, and Deer Creek Reservoir. The extent of the floodplains along the creeks and Provo River in the Project Area are limited to widths of 60 to 90 meters (200 to 300 feet). Because of the narrow width of the floodplains relative to the length of the Project, maps of these areas have not been included in this document. However, according to the flood insurance rate maps prepared for the Federal Insurance Administration to aid in the administration of the NFIP, the existing U.S. 189 (US-189) pavement and both the 1989 SEIS and 2002 Preferred Alignment s are above the 100-year flood elevation throughout current Project Area. None of the base flood elevations or flood hazard factors for the 100-year floodplains within the Project Area have been determined by FEMA.

Hazardous Waste Sites

No known or potential hazardous waste sites regulated by the Resource Conservation and Recovery Act or the Comprehensive Environmental Response, Compensation, and Liability Act are located within the Project Area, nor have any nonregulated hazardous waste sites been identified by the Utah Department of Health.

Vegetation and Wildlife

Descriptions of the existing vegetation and wildlife communities within the overall Project Area were obtained via reports (Shapiro 1989a, Smith 1989) prepared specifically for the first SEIS

(FHWA 1989a). These reports provided information related to vegetative conditions, current wildlife use, and anticipated impacts resulting from the US-189 realignment alternatives. Information from those reports and additional new data collected were used in the development of the Preferred Alternative during the Environmental Re-evaluation of the SEIS (BIO-WEST 1995). Vegetation and habitat conditions have not significantly changed since the 1995 Re-evaluation, but updated information and analyses have been used where appropriate. Additional coordination was implemented with the U.S. Fish and Wildlife Service (USFWS) and the UDWR in regard to any changes or potential new impacts associated with the Preferred Alternative.

Existing habitats were evaluated for threatened, endangered, and candidate plant and animal species using criteria identified in current literature (i.e., elevational requirements, vegetation communities, and structural components). Topography maps, site visits, aerial photographs, and wetland maps were used to delineate habitat. Major habitats within the Project Area were quantified in hectares and acres. The quality of the habitat was evaluated using a variety of criteria including habitat patch size, distribution, and connectivity to adjacent patches. Big game seasonal ranges were delineated by the UDWR.

Coordination with the USFWS and the UDWR has been maintained throughout the Project to document wildlife-related concerns. In compliance with the Endangered Species Act of 1973, as amended, the USFWS provided an updated listing of threatened, endangered, and candidate plant and animal species known or suspected to occur within the Project Area for which potential impacts must be assessed (Harris 2000a). During agency scoping for the Project, the UDWR voiced concerns related to impacts to big game, nesting raptors (including golden eagles), and riparian vegetation loss or degradation (Fairchild 1994; Pederson 1994a, 1994b, 1995, 2000). The USFWS reiterated the UDWR concerns relative to potential impacts to nesting golden eagles near Deer Creek Dam (Harris 2000b).

General Vegetation and Wildlife Habitat

Dominant plant communities, or habitats, within the Project Area and their importance to wildlife are described below and summarized in Table 3-2. More-detailed information on wetland communities is provided in the Wetlands section of this chapter.

Riparian and Palustrine Forested Wetlands (PF)

Palustrine forested wetlands (PF wetlands) and riparian forests are separated for Federal regulatory purposes only. Because the two communities are functionally very similar, they have been combined into one habitat type for this assessment. The riparian and wetland forested habitat is located primarily within a narrow area bordering the Provo River. The habitat is relatively fragmented by disturbed areas resulting from recreational use and road construction. Dominant tree species include box elder (*Acer negundo*), big-tooth maple (*Acer grandidentatum*), chokecherry (*Prunus virginiana*), and narrow-leaf cottonwoods (*Populus angustifolia*). The understory typically contains a variety of shrubs and forbs including willow (*Salix* spp.) and red-osier dogwood (*Cornus stolonifera*). The composition of the habitat provides great structural diversity and relatively closed

Table 3-2. Habitats within the Project Area and Their Associated Importance to Wildlife and Rare Species.^a

WILDLIFE HABITAT TYPE	POTENTIAL SPECIES DIVERSITY^b				VALUE OF HABITAT		
	MAMMALS	BIRDS	REPTILES	AMPHIBIANS	BIG GAME (MULE DEER & ELK)	RAPTORS	RARE SPECIES^c
Riparian/ Wetland Forests	46	68	7	5	Thermal and protective cover.	Roosting and nesting trees for raptors.	Important winter roosts for bald eagle. Riparian corridor important for river otter.
Scrub-Shrub Wetlands	12	6	1	5	Forage and cover.	Habitat for a variety of prey species.	No rare species are known in this habitat.
Emergent Wetlands	21	17	1	5	Winter habitat.	Habitat for a variety of prey species.	No rare species are known in this habitat.
Open Water	3	12	0	5	Water source for big game.	Minimum value.	Provo River provides important habitat for river otter and June sucker, and a fishery for wintering bald eagles.
Oak/Maple Woodland	39	52	8	1	Provides thermal and protective cover.	Roosting and nesting trees.	Possible roosting sites for bald eagle.
Sagebrush	30	47	7	0	Important winter habitat. Used as forage.	Habitat for a variety of prey species.	No rare species are known in this habitat.
Grassland	29	23	7	5	Winter habitat.	Habitat for a variety of prey species.	No rare species are known in this habitat.
Coniferous Forest	29	39	3	0	Provides thermal and protective cover.	Roosting and nesting trees.	Possible roosting sites for bald eagle.

^a Based on Shapiro (1989a) and Smith (1989).

^b Number of species potentially occurring within each habitat type.

^c Utah valvata snail and Canada lynx were not assessed in the source documents (Shapiro 1989a, Smith 1989).

canopy. Nesting and roosting sites, protective cover, and foraging opportunities are abundant for a diversity of wildlife species within these forests.

This habitat is potentially inhabited by 46 species of mammals, 68 species of birds, 7 species of reptiles, and 5 species of amphibians (Smith 1989). Riparian habitat along the river is particularly important to the northern river otter (*Lutra canadensis*), which is considered a Utah sensitive species because of declining populations and limited distribution (UDWR 1998). Although northern river otter have been very rare in Utah during the past 100 years, a few sightings have been reported in the Provo River drainages in recent years (UDWR 1998). Factors that currently limit the value of the riparian and wetland forests include the linear shape and fragmented nature of the habitat and the high disturbance levels associated with recreational use of the river and its proximity to the existing highway.

Palustrine Scrub-Shrub Wetlands (PSS)

The scrub-shrub wetland (PSS) communities are located along the Provo River and surrounding areas. Dominant plant species include willow and red-osier dogwood with an understory of redtop bentgrass (*Agrostis alba*), reed canarygrass (*Phalaris arundinacea*), and aster (*Aster chilensis*). The scrub-shrub wetland type potentially provides habitat for 12 species of mammals, 6 species of birds, 1 species of reptile, and 5 species of amphibians (Smith 1989).

Palustrine Emergent Wetlands (PEM)

Emergent wetlands (PEM), dominated by cattail (*Typha latifolia*), sedges, rushes, and reed canarygrass, occur infrequently throughout the Project Area. These patches are small and of ineffective size for most species associated with the habitat type. Nevertheless, the emergent wetlands within the Project Area potentially provide habitat for 21 species of mammals, 17 species of birds, 1 species of reptile, and 5 species of amphibians (Smith 1989).

Open Water

The open water habitat within the Project Area includes both riverine habitat (the Provo River and associated tributaries, riverine-upper perennial [PER]) and small, dispersed ponds. Three species of mammals (including northern river otter) and 12 species of birds potentially occupy the open water habitat (Smith 1989). The ponds may be utilized by five species of amphibians, particularly during the breeding season when open water is needed for breeding and egg deposition. While not completely dependent on the habitat type, numerous other wildlife species commonly use open water habitat as a water source.

Oak/Maple Woodlands

The oak/maple woodland habitat is composed of variously sized Gambel's oak (*Quercus gambelii*) and big-tooth maple. Similar to the riparian habitat, the oak/maple woodland provides numerous nesting and roosting sites, protective cover, and foraging opportunities associated with the structural diversity and relatively closed canopy. This habitat is potentially inhabited by 39 species of mammals, 52 species of birds, 8 species of reptiles, and 1 species of amphibian (Smith 1989).

Sagebrush Shrubland

The sagebrush shrubland habitat is a shrub community composed of sagebrush (*Artemesia tridentata*), rabbitbrush (*Chrysothamnus nauseosus*), western yarrow (*Achillea millifolium*), and a variety of grasses. The habitat occurs on the dry, south-facing slopes adjacent to the Provo River. This habitat is potentially inhabited by 30 species of mammals, 47 species of birds, and 7 species of reptiles (Smith 1989). In particular, the habitat type provides important forage during stressful winter months for wintering mule deer (*Odocoileus hemionus*) and elk (*Cervus canadensis*).

Grassland

The grassland habitat is dominated by bluebunch wheatgrass (*Agropyron spicatum*) and bluegrass (*Poa* spp.) and occurs mainly on south-facing slopes. Scattered shrubs occur throughout the habitat. The grassland habitat is potentially inhabited by 29 species of mammals, 23 species of birds, 7 species of reptiles, and 5 amphibians (Smith 1989).

Coniferous Forest

The coniferous forest habitat is represented primarily by Douglas-fir (*Pseudotsuga menziesii*) with an understory of snowberry (*Symphoricarpos* spp.) and is located on the southeastern side of the Provo River. Approximately 29 species of mammals, 39 species of birds, and 3 species of reptiles potentially utilize the habitat type (Smith 1989).

Noxious Weeds

Under the Federal Noxious Weed Act of 1974, noxious weeds are defined as those plants that are “of foreign origin, are new to or not widely prevalent in the United States, and can directly or indirectly injure crops, or other useful plants, livestock, or poultry or other interests of agriculture, including irrigation, or navigation, or the fish or wildlife resources of the United States or the public health” (FNWA 1975).

Noxious weeds typically have characteristics that enhance their capability to successfully reproduce and spread over long distances. For example, these species often have prolific seed production, the ability to reproduce vegetatively, and highly effective means of seed dispersal (e.g., the presence of hooks or barbs on the seeds enabling them to attach to animal fur, clothing, vehicles, and equipment). Characteristics such as these allow for rapid natural spread into pristine or semi-pristine environments, thus interfering with species composition, structure, and ecosystem processes of the native plant communities.

The State of Utah defines noxious weeds as “any plant that is especially injurious to public health, crops, livestock, land, or other property” (USGS 2000). Plants that appear on the Utah noxious weed list can be found in Table 3-3. County noxious weeds are “any plant which is not on the State Noxious Weed List, is especially troublesome in a particular county, and is declared to be a noxious weed within the county” (USGS 2000). Construction activities would occur in Wasatch County, which maintains a separate list from the State of Utah’s. Wasatch County’s noxious weeds are also listed in Table 3-3.

Table 3-3. Noxious Weeds in the State of Utah and Wasatch County.

COMMON NAME(S)	SPECIES
State of Utah Noxious Weeds	
bermudagrass	<i>Cynodon dactylon</i>
field bindweed (wild morning-glory)	<i>Convolvulus</i> spp.
whitetop	<i>Cardaria</i> spp.
perennial sorghum (Johnson grass)	<i>Sorghum halepense</i> , <i>Sorghum alnum</i>
diffuse knapweed	<i>Centaurea diffusa</i>
Russian knapweed	<i>Centaurea repens</i>
spotted knapweed	<i>Centaurea maculosa</i>
squarrose knapweed	<i>Centaurea squarrosa</i>
purple loosestrife	<i>Lythrum salicaria</i>
Medusahead	<i>Taeniatherum caput-medusae</i>
perennial pepperweed (broad-leaved peppergrass, tall whitetop)	<i>Lepidium latifolium</i>
quackgrass	<i>Agropyron repens</i>
leafy spurge	<i>Euphorbia esula</i>
yellow starthistle (Barnaby's thistle)	<i>Centaurea solstitialis</i>
Canada thistle	<i>Cirsium arvense</i>
musk thistle	<i>Carduus nutans</i>
Scotch thistle (cotton thistle)	<i>Onopordium acanthium</i>
dyers woad	<i>Isatis tinctoria</i>
Wasatch County Noxious Weeds	
Dalmation toadflax	<i>Linaria genistifolia</i>
yellow toadflax	<i>Linaria vulgaris</i>
houndstongue	<i>Cynoglossum officinale</i>

Source: Merritt et al. 2000, Utah Department of Agriculture and Foods 2000.

Big Game

Mule deer and elk use all habitats within the Project Area extensively. The timbered areas (riparian and wetland forests, oak/maple woodlands, and coniferous forests) provide thermal cover, security, and forage for both species. The sagebrush, scrub-shrub wetlands, and grasslands also provide foraging habitat. Big game commonly use the ponds and riverine habitat for water. Deer and elk will frequently cross the road to reach the Provo River, periodically resulting in mortality from automobile collisions.

To effectively manage big game populations, the UDWR classifies public lands into seasonal ranges based on their period of use (summer versus winter) and their relative importance to mule deer and elk. Specific to the current Project Area, high priority deer winter range and critical deer winter range extend into the area (FHWA 1989a; Pederson 1994a, 1994b, 1995, 2000). Based on numerous

observations of the actual animals and signs of their occurrence during site visits, certain areas within the current Project segment are heavily used by both deer and elk during fall and spring migration and the winter months.

The list of Utah's new and invading potential noxious weeds appears in Table 3-4.

Table 3-4. New and Invading Potential Noxious Weeds in the State of Utah.

COMMON NAME	SPECIES
velvetleaf	<i>Abutilon theophrasti</i>
jointed goatgrass	<i>Aegilops cylindrica</i>
camelthorn	<i>Alhagi camelorum</i>
purple starthistle	<i>Centaurea calcitrapa</i>
water hemlock	<i>Cicuta douglasii</i>
poison hemlock	<i>Conium maculatum</i>
yellow nutsedge	<i>Cyperus esculentus</i>
goatsrue	<i>Galega officinalis</i>
black henbane	<i>Hyoscyamus niger</i>
St. Johnswort	<i>Hypericum perforatum</i>
Dalmation toadflax	<i>Linaria dalmatica</i>
yellow toadflax	<i>Linaria vulgaris</i>
wild proso millet	<i>Panicum miliaceum</i>
silverleaf nightshade	<i>Solanum elaeagnifolium</i>

Source: USGS 2000.

Birds

Sandhill Crane

The sandhill crane (*Grus canadensis*) breeds primarily in Alaska, northern Canada, and the Great Lakes region, but small, scattered breeding populations are also found in the northwestern United States (including northeastern Utah), the southeastern United States, and Cuba. With the exception of populations in the southeastern United States and Cuba, breeding populations migrate south to wintering grounds in the southern United States and northern Mexico (UDWR 2000a). Sandhill crane are generally uncommon in Utah. However, in certain localities they can be common. They utilize open wet areas and are more common in areas with large expanses of wet meadow areas (natural wetlands and irrigated fields). A nesting pair of sandhill crane has been reported in the Canyon Meadows area of Provo Canyon (Sakaguchi 2000).

The sandhill crane is usually found foraging in open grasslands, meadows, and marshy portions of lakes, ponds, and rivers. Its diet is diverse, consisting of roots, tubers, seeds, grain, berries, small vertebrates, and invertebrates. At night, flocks roost in open expanses of shallow water. Sandhill cranes are monogamous. Birds may breed after they reach 3 years of age, but pairs often do not successfully reproduce until they reach 5 or 6 years of age. Nests are usually constructed on the ground or over shallow water. Females typically lay two eggs in the spring following elaborate courtship rituals. Male and female parents share incubation duties during the day, but females incubate at night; eggs hatch after 29 to 32 days. Young leave the nest with the parents shortly after hatching and forage on their own within a day of hatching. They are able to fly after about 2 months, but they usually remain with the parents until the following year. Although two eggs are laid, it is uncommon for more than one chick to survive to adulthood. If a nest is lost, the parents often will re-nest (UDWR 2000a).

Wild Turkey

The Rio Grande wild turkey (*Meleagris gallopavo intermedia*) is one of two subspecies of Utah's largest game bird. Adult males (gobblers or toms) weigh from 17 to 21 pounds. Adult females (hens) average 8 to 11 pounds. The Rio Grande wild turkey subspecies is native to the south-central plains states and northeastern Mexico, and was introduced in Utah in 1984. Rio Grande wild turkeys are found in a variety of areas throughout Utah, from Box Elder County in the north to Utah County in Central Utah and in Southern Utah's San Juan and Iron Counties. Numerous other sites throughout the state have been identified as suitable habitat. Trapping and transplanting birds from other states such as Kansas, Oklahoma, and Texas, and relocation of birds within Utah, will be the focus of management in the near future. Public interest in wild turkey management in Utah is skyrocketing and is expected to continue to do so in the future (UDWR 2000b).

Rio Grande wild turkey prefers cottonwood river bottoms associated with oak-pine and pinyon-juniper forests (UDWR 2000b). "Mast" plants such as pine nuts, juniper berries, and acorns are important food sources. Grasses, weed seeds, and green, leafy vegetation are also eaten by Rio Grande wild turkey. Insects are extremely crucial in the diet of young poult in the summer (UDWR 2000b). Courtship activities begin in early spring. Rio Grande wild turkeys select nest sites that have good concealing herbaceous or woody cover and water nearby. Hens lay a clutch of 10 to 12 eggs, which takes about 2 weeks. Continuous incubation takes about 26 days (UDWR 2000b).

Although there are no on-going, definitive counts of Rio Grande wild turkey in Provo Canyon, a UDWR biologist counted 60 Rio Grande wild turkeys in the Canyon Meadows area of Provo Canyon in late November 2000 (Sakaguchi 2000). Wild turkey numbers are generally increasing in Utah because of recent introductions of the birds into suitable habitat areas and natural reproduction success in these suitable habitats. The species is fairly mobile and seasonally migrate by flight from one side of Provo Canyon to the other. There is suitable habitat on both sides of the Provo Canyon for the birds. Rio Grande wild turkey nest in very thick cover (oak brush stands) and bring their broods to open meadow areas to feed (Sakaguchi 2000).

Raptors

Numerous raptor species use the Project Area. These species include wintering bald eagles (*Haliaeetus leucocephalus*) (see following discussion of threatened, endangered, and candidate vegetation and wildlife species), nesting golden eagles (*Aquila chrysaetos*), peregrine falcons (*Falco peregrinus*), American kestrels (*Falco sparverius*), red-tailed hawks (*Buteo jamaicensis*), Cooper's hawk (*Accipiter cooperii*), and great-horned owls (*Bubo virginianus*). Of particular importance are the golden eagles that currently nest on the rocky slopes adjacent to the Wildwood to Deer Creek State Park Project Segment (Harris 2000b; Pederson 1994a, 2000). The active nests are monitored on an annual basis by the UDWR (Hintze 2000). Most other raptor species use the coniferous and deciduous forests up-slope from the highway corridor for nesting and prey forage within the surrounding sagebrush and grassland habitats (Table 3-2). Foraging habitat is located within the current Project segment away from areas of high disturbance.

Peregrine falcon occurs in Utah and Wasatch Counties. While peregrine falcons are not known to nest within the Provo River drainage, they may occur infrequently as migrants. All vegetation types, especially riparian and wetland habitats, provide important habitat for a diversity of peregrine falcon prey (BIO-WEST 1995). Peregrine falcon was removed from the Federal list of endangered and threatened species in 1999. Protection for peregrine falcon is provided under authority of the Migratory Bird Treaty Act (16 U.S.C. 703-712), which makes it unlawful to take, kill, or possess migratory birds, their parts, nests, or eggs. Federal and State permits are required if impacts to peregrine falcon will occur (Harris 2000a).

Columbia Spotted Frog

It has been suggested that all spotted frog populations occurring in Utah are Columbia spotted frog (*Rana luteiventris*) (Perkins and Lentsch 1998). In Utah, isolated Columbia spotted frog populations exist in the West Desert and along the Wasatch Front (UDWR 2000c), and they potentially occur in the Project Area (Harris 2000a). Habitat degradation and loss have led to declines in many of the Utah populations, especially those along the Wasatch Front, precipitating the inclusion of the species on the Utah Sensitive Species List (UDWR 2000c). With a goal of recovering the Columbia spotted frog, several government agencies are working cooperatively under a Conservation Agreement and Strategy to eliminate or significantly reduce the threats facing the species (Perkins and Lentsch 1998). Such agreements are voluntary cooperative plans among resource agencies that identify threats to a species and implement conservation measures to proactively conserve and protect species in decline (Harris 2000a).

Columbia spotted frog breeds as early in the spring as winter thaw allows, with eggs hatching in 3 to 21 days, depending on temperature. The species seems to prefer isolated springs and seeps that have a permanent water source, although individuals are known to move overland in spring and summer after breeding. During cold winter months, Columbia spotted frogs burrow in the mud and become inactive. Adult frogs eat a wide variety of food items, ranging from insects to snails, whereas tadpoles eat algae, plants, and small aquatic organisms (UDWR 2000c).

Two Columbia spotted frog populations were found in the Provo River in Heber Valley (between Jordanelle Dam and Deer Creek Reservoir) during surveys in 1991 and 1992 (Perkins and Lentsch 1998). Two individuals were also reported in Salamander Lake in the North Fork of Provo River past Sundance (Shirley 1994). Other than these known locations, there are no known populations in the Provo River in Provo Canyon (Wilson 2000). Surveys for spotted frog (the species previously referred to as Oregon spotted frog [*Rana pretiosa*] and currently called Columbia spotted frog [*Rana luteiventris*]) were conducted in 1994 along the stretch of Provo River and adjacent wetland habitat from the Deer Creek State Park entrance downstream to Wildwood. Up-slope areas that were also searched consisted of habitat that would be directly or indirectly impacted by the 2002 Preferred Alignment. No spotted frogs (including egg masses, larvae, and adults) were discovered. Habitat was considered unsuitable for spotted frogs during the evaluation (Yeager 1994, 2001). Table 3-2 summarizes existing vegetation and wildlife in the Project Area.

Threatened, Endangered, and Candidate Species

In preparation for the 1995 Re-evaluation (BIO-WEST 1995), the USFWS identified various threatened, endangered, and candidate wildlife species potentially occurring in Utah and Wasatch Counties (Williams 1994). Species presence surveys were conducted before the 1995 Re-evaluation (BIO-WEST 1995) and were limited to those species that were listed since the initiation of the 1989 SEIS (FHWA 1989a). These species included the threatened Ute ladies'-tresses orchid (*Spiranthes diluvialis*), the Columbia spotted frog, and the endangered Utah valvata snail (*Valvata utahensis*). Survey methods and results were provided in a separate report and submitted to the USFWS for concurrence (Gantz 1995). The USFWS concurred that these three species do not occur in the Project Area (Williams 1995).

In preparation for the current SEIS, the USFWS again identified various threatened, endangered, and candidate wildlife species potentially occurring in the Project Area (Harris 2000a). Because many threatened and endangered species are mobile, information is given for Utah County as well as Wasatch County. In Utah County, species include the threatened bald eagle (wintering populations), the threatened Canada lynx (*Lynx canadensis*), the endangered clay phacelia (*Phacelia argillacea*), the threatened Deseret milkvetch (*Astragalus desereticus*), the endangered Utah valvata snail, and the threatened Ute ladies'-tresses. In Wasatch County, species include the bald eagle, Canada lynx, and the threatened Ute ladies'-tresses (Harris 2000a). A brief discussion of these species is given below. No candidate species were identified in the Project Area (Harris 2000a). Columbia spotted frog is not discussed below as a threatened or endangered species because it is not Federally listed as such with the USFWS (Williams 2000a). It is, however, discussed in the previous section since a Conservation Agreement and Strategy has been developed for the species.

Bald Eagle

The bald eagle is listed as a threatened species by the USFWS in the contiguous 48 states. The UDWR also considers it to be threatened in Utah. Despite the recovery of populations in recent decades, only four nest sites were known in Utah as of 2000 (UDWR 2000d).

Bald eagles are known to use the cottonwood forests in the Project Area for winter roosting, particularly within the areas just east of Wildwood and just below Deer Creek Dam. Nesting within the Provo River drainage has not been reported, nor are future nesting attempts probable, because of intense recreational use and the proximity of the existing highway. Abundant winter food supply is associated with the fishery in Provo River and deer and elk carrion on the surrounding winter ranges.

Canada Lynx

Canada lynx is a medium-sized cat that is listed as a sensitive species by the UDWR and as a threatened species by the USFWS. The range of Canada lynx extends from Canada and Alaska south to Maine, the Rocky Mountains, and the Great Lakes region. Although Canada lynx has been found in Utah in the past, it is unknown if the species is still extant in the state, as only three Utah occurrences of the species have been reported in the past 20 years. If Canada lynx still does exist in Utah, it is undoubtedly very rare (UDWR 2000e).

Clay Phacelia

Clay phacelia is a Federally listed endangered plant that only occurs in Spanish Fork Canyon, Utah County, Utah. A member of the waterleaf family, this species is a winter annual with abundantly hairy, simple to branching stems. It has a scorpion tail-like inflorescence that continues, as it unrolls, to produce blue to violet flowers from June to August. Construction activities have modified some of this plant's habitat, and grazing by native ungulates and the presence of exotic plant species in its habitat are both potential threats (UDWR 2000f).

Deseret Milkvetch

Deseret milkvetch, considered extinct until its rediscovery in 1981, exists in one small population in Utah County, Utah (USFWS 2000). A member of the bean family, the Federally threatened Deseret milkvetch is a perennial herb with gray-silvery leaves and white to pinkish petals with evident lilac-colored keel-tips (UDWR 2000g).

Only one population is known and exists in western Utah County. Extensive searches of similar habitat in Utah and Sanpete Counties, Utah, have failed to identify any other populations (USFWS 2000). The species' habitat is State and privately owned land, and is mainly a wildlife management area that is also used for cattle grazing (UDWR 2000g).

Utah Valvata Snail

The Federally and State-listed endangered Utah valvata snail, also called the desert snail, has been documented in the Lake Bonneville Basin, the Bear River, Bear Lake, the Snake River, and a few isolated sites in southern California. Since 1884, living specimens of the Utah valvata snail have not been observed in Utah despite extensive searches (Ecosearch 1991). At this time, the only known locations of live colonies are restricted to a few sites on the Snake River in Idaho (Gore 1990).

Biological inventories were conducted in 1994 in preparation for the 1995 Re-evaluation (BIO-WEST 1995). The Utah valvata snail was not identified among the samples of gastropods that were collected at various locations along the Provo River. The potential for occurrence is low because of lack of observance during previous searches in surrounding areas including Utah Lake and lack of optimal habitat conditions (BIO-WEST 1995). The USFWS (Williams 1995) concurred that populations of Utah valvata snail do not occur in areas potentially affected by the 2002 Preferred Alignment.

Ute Ladies'-tresses

All populations of the Federally threatened Ute ladies'-tresses have been found on wetland sites that remain moist throughout the growing season (USFWS 1992). In Utah, specimens have been documented in old stream channels and on recently deposited material within the floodplain of adjacent rivers (UNHP 1994).

Two colonies were found along the Provo River near the Jordanelle Dam. Colonies were also found in wetlands on the shores of Utah Lake, which the Provo River flows into. Since the species' seeds are dispersed by water, populations would be expected to occur between these sites if suitable habitat were available. However, the Provo River has been constrained and no longer has the dynamic meandering character of a free-flowing river. Wetlands along the river mainly consist of very thick riparian scrub/shrub vegetation. All other wetland areas are either scoured by the river every year or are converted wetland areas used as lawns, campgrounds, houses, or other developments. All wetlands in the Project Area were surveyed for Ute ladies'-tresses in 1994. None were found during this search, nor do any previous records exist of colonies within the Project Area (UNHP 1994). The USFWS has concurred (Williams 1995) that populations of Ute ladies'-tresses do not occur in areas potentially affected by the 2002 Preferred Alignment.

Wetlands

Information regarding jurisdictional wetlands within the Provo River drainage was obtained from a previous technical report written for the Project (Shapiro 1989a) that provided information related to plant community descriptions, including Section 404 wetland habitats. This report also provided information related to impacts resulting from the 1989 SEIS Alignment to Section 404 wetland habitats. Because the 2002 Preferred Alignment deviates in some areas from the 1989 SEIS Alignment, and because the Project must meet Section 404 permit requirements, additional detailed descriptions of potentially affected wetlands are provided below.

Wetlands are regulated as Waters of the United States by the Federal government, mainly through the U.S. Department of the Army, Corps of Engineers (Corps) in accordance with Section 404 of the Federal Clean Water Act (CWA). Section 404 authorizes the Corps to regulate certain activities involving the excavation and/or discharge of dredged or fill materials into wetlands and special aquatic sites, as well as other Waters of the United States (e.g., streams, rivers, lakes). The CWA also grants the U.S. Environmental Protection Agency (EPA) the authority to review and veto Corps

decisions regarding the issuance of permits under the Section 404 Regulatory Program. Thus, Federal wetland regulation is shared jointly by the EPA and Corps.

The EPA defines special aquatic sites as geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values (EPA, 40 Code of Federal Regulations [CFR] 230.3). Special aquatic sites include wetlands, mudflats, vegetated shallows, riffle and pool complexes, coral reefs, sanctuaries, and refuges. Both the EPA and the Corps define jurisdictional wetlands as areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (EPA, 40 CFR 230.3; Corps, 33 CFR 328.3). Generally, the Corps defines normal circumstances as the soil and hydrological conditions that are normally present in an area, without regard to whether the vegetation has been removed or otherwise disturbed.

Field inspections within the Wildwood to Deer Creek State Park Project Segment were conducted in May, June, and July 1994. During the field inspections, wetland boundaries were identified and delineated in accordance with the three-parameter approach described by the Corps' *Wetlands Delineation Manual* (Environmental Laboratory 1987). This manual outlines the mandatory technical criteria, field indicators, and recommended procedures for identifying wetland boundaries. These methodologies are consistent with current Federal regulatory agency protocol for delineating jurisdictional wetland boundaries.

During field inspections, efforts were focused primarily on the completion of wetland mapping. Sample plots were established as needed to verify delineated jurisdictional wetland boundaries. Sample plots were located on either side of the wetland boundary to assess hydrological, soil, and vegetative parameters. Both wetland and adjacent upland habitats were sampled for contrast and comparison.

Corps' Data Form 1 (Environmental Laboratory 1987) was not completed for all alignments under consideration. Rather, wetland sample points were used only for mapping purposes. The Corps agreed that this approach was acceptable for comparing wetland impacts among the alternative highway alignments considered. However, for Section 404 permitting purposes, data sheets were completed at a later date for those wetlands impacted by the 2002 Preferred Alignment.

Delineated wetlands were classified by habitat type in accordance with guidelines suggested by the USFWS (Cowardin et al. 1979). During the field inspection, the extent of wetland boundaries were assessed with the aid of 1:2000-scale aerial photographs of the Project Area and were noted on 1:2000-scale Project Area topographic maps with 5-meter (16-foot) contours. Afterwards, the wetland mapping information was digitized into electronic map files using AutoCAD.

A total of six jurisdictional habitats were identified: Palustrine Emergent, Palustrine Scrub/Shrub, Palustrine Forested, Riverine-Upper Perennial, Riverine-Intermittent, and Open Water. A description of each habitat type is provided below.

Palustrine Emergent Wetlands (PEM)

Palustrine emergent (PEM) wetlands are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens (Cowardin et al. 1979). Typically, herbaceous vegetation is present for most of the growing season, although natural climatic fluctuations may result in the periodic inundation of these wetlands during some years. Plant communities usually are dominated by non-persistent perennial species that fall to the ground at the end of the growing season.

Most PEM wetlands within the current Project Area occur near Horseshoe Bend, south of the Canyon Meadows residential development. The PEM wetlands appear to be supported by groundwater that occurs near the surface, discharge from numerous seeps and springs, and water from intermittent streams.

Dominant plant species include sedges (*Carex* spp.), alpine timothy (*Phleum alpinum*), rushes (*Juncus tenuis* and *Juncus balticus*), spike rush (*Eleocharis* spp.), horsetail (*Equisetum arvense*), and American bistort (*Polygonum bistortoides*). Soils underlying PEM wetlands usually are silty loams with dark chromas occurring throughout the upper 40 centimeters (16 inches) of the soil profile.

Palustrine Scrub/Shrub (PSS)

Palustrine scrub/shrub (PSS) wetlands are dominated by woody vegetation less than 6 meters (20 feet) tall. Vegetation may include shrubs, young trees, or trees stunted as a result of environmental conditions. A PSS wetland may represent a successional stage leading to forested wetland, or it may be a relatively stable community (Cowardin et al. 1979).

In general, PSS wetlands occur along stream courses and isolated springs. Several hydrological sources appear to support these wetlands, including the alluvial aquifer of stream courses, isolated springs and seeps arising from subsurface interflows, seasonal flooding, and surface runoff. Most of the PSS wetland acreage is situated along the banks of the Provo River. Typically, underlying substrates are mineral soils of alluvial and colluvial origins.

These wetlands are dominated by willows and red-osier dogwood. Other common woody species include poison ivy (*Toxicodendron radicans*) and saplings of narrow-leaf cottonwood and box elder.

Palustrine Forested (PF)

Palustrine forested wetlands (PF) are dominated by woody vegetation greater than 6 meters (20 feet) tall. These wetlands normally support an overstory of trees, an understory of young trees and/or shrubs, and a herbaceous layer (Cowardin et al. 1979).

In general, the occurrence of PF wetlands in the Project Area is limited to the riparian corridor of the Provo River. Springs and seeps supported by subsurface interflows originating from adjacent mountain slopes and groundwater from the alluvial aquifer are most likely the two primary hydrological sources supporting these wetlands. Seasonal flooding and surface runoff are probably minor hydrological sources. Soils are of both alluvial and colluvial origins and vary from sandy silt loams to cobble, depending on location.

The overstory vegetation of the PF wetlands is dominated by narrow-leaf cottonwoods and box elder with trembling aspen (*Populus tremuloides*) occurring infrequently. Understory vegetation is usually dominated by willows and red-osier dogwood.

Riverine-Upper Perennial (PER)

Riverine-upper perennial (PER) habitat within the Project Area consists of the perennial stream flows of the Provo River and Deer Creek. Both linear length and acreage of perennial stream within the affected environment have been estimated.

Riverine Intermittent (INT)

Intermittent streams (INT) have defined channels, but unlike perennial streams, they do not usually support flowing water throughout the year. Typically, flowing water ceases during the driest months of the year. When water is not flowing, isolated pools and/or near-surface groundwater may be present in stream channels.

Intermittent streams in the Project Area are unnamed tributaries to the Provo River arising from micro-drainages and/or isolated springs. The unnamed tributaries have a defined bed and bank, but their channels are very narrow (0.5- to 1.0-meter [1.6- to 3.3-feet] wide) and shallow (<0.5-meter [1.6-feet] deep), and water flows for only part of the year. The amount and duration of flowing water varies and is most likely dependent on the amount of snow pack. There is virtually no floodplain development.

The linear length of intermittent streams in the Project Area has been calculated. However, because of the lack of persistent stream flow and the small surface area of channel, size of riverine-intermittent habitat was not calculated separately. Rather, size of intermittent streams are included with the analyses of the wetlands they flow through.

Open Water

Open water in the Project Area consists of a constructed pond at the Canyon Meadows residential development and Deer Creek Reservoir.

Wetland Functions and Values

The wetland habitat types identified in the Project Area support several biological functions including fish and wildlife habitat, biodiversity, river bank stabilization, filtration of upland runoff, and recreational opportunities. The values of these functions are dependent on several factors

including habitat type, habitat size and shape, current land management, past land management, and position in the landscape.

Values of fish and wildlife functions are assessed in the Wildlife and Vegetation section and the Fisheries section of this chapter. Because of Utah's semiarid climate, wetlands typically are minor landscape components. For example, riparian-wetlands represent less than 2 percent of the total land cover in Utah. Hence, wetlands within the Project Area represent relatively rare habitats and are important components for maintaining animal and plant biodiversity within the state (FHWA 1989a).

Wetland habitats bordering Deer Creek and Provo River also help to stabilize stream banks and provide buffers to filter upland runoff, thereby improving water quality. The riverine habitat of the Provo River supports valued fishing opportunities.

Fisheries

The Provo River and its associated waterways form a valuable fisheries resource, primarily because of the high productivity of these waters close to the population centers of the Wasatch Front (FHWA 1989a). Descriptions of these waters were obtained from a previously prepared, Project-specific technical report (Smith 1989). The first SEIS (FHWA 1989a) presented the affected environment and environmental consequences to the Provo River resulting from implementation of the 1989 SEIS Alignment. The 2002 Preferred Alignment would move away from, and thus would not directly affect, the Provo River, so the existing conditions of and impacts to the Provo River are not discussed in this document. The following fisheries information focuses on the existing conditions of Deer Creek, which would be affected by the 2002 Preferred Alignment.

Four categories of stream habitat are used in the UDWR classification system. These categories, presented in descending order of importance, include Critical, High Priority, Substantial Value, and Limited Value. Deer Creek within the Project Area has been designated a Class 4 (i.e., Critical) fishery, indicating that it is a "sensitive area that, because of limited abundance and/or unique qualities, constitutes irreplaceable, critical requirements for high interest wildlife." Relatively natural flow and temperature regimes of Deer Creek, in addition to an abundance of clean gravels in the channel, provide crucial spawning habitat for brown trout (*Salmo trutta*) and rainbow trout (*Salmo gairdneri*). Stable late summer flows and high water quality also provide important year-round habitat for adult trout.

Trout habitat quality in Deer Creek upstream of the existing highway was evaluated using Habitat Quality Index (HQI) procedures (Binns 1982). Results of the HQI evaluation indicated that Deer Creek provides adequate quality of trout habitat to support a biomass of approximately 310 pounds per acre or 334 habitat units per acre of trout habitat.

Population estimates in Deer Creek upstream of the existing highway were conducted using multiple pass electrofishing techniques and calculated using Microfish 3.0 (Van Deventer and Platts 1989).

Population sizes for all life stages of brown trout were estimated to be 489 fish per acre. Rainbow trout were also captured in Deer Creek, but numbers were insufficient to calculate population size.

Threatened, Endangered, and Candidate Species

During agency scoping for the 1995 Re-evaluation (BIO-WEST 1995), the USFWS identified various threatened, endangered, and candidate species potentially occurring in the Project Area in Utah and Wasatch Counties (Williams 1994), and no fish species were identified. In subsequent scoping for the current SEIS, the USFWS again identified various threatened, endangered, and candidate species potentially occurring in the Project Area in Utah and Wasatch Counties (Harris 2000a). This list included the endangered June sucker (*Chasmistes liorus*) in the Provo River in Utah County (Harris 2000a). A brief discussion of June sucker, its habitat requirements, and known occurrences within the region is provided below.

June Sucker

Critical June sucker habitat is designated in Utah County (Harris 2000a). The June sucker (*Chasmistes liorus*) species is very narrowly distributed, occurring naturally in Utah Lake and the Provo River and nowhere else in the world. Although the species was once abundant in Utah Lake, it is now extremely rare. Major causes of the June sucker's decline include flow alterations, pollution, drought, hybridization with other sucker species, and competition with and predation from exotic fish species (UDWR 2000h). The June sucker is both Federally and State-listed as endangered, and efforts to help recover the population are on-going (UDWR 2000h).

Although June sucker are members of the sucker family, they are not bottom feeders. The jaw structure of the June sucker allows the species to feed on zooplankton in the middle of the water column. June sucker adults leave Utah Lake and swim up the Provo River to spawn in June of each year. Spawning occurs in shallow riffles over gravel or rock substrate. Fertilized eggs sink to the stream bottom, where they hatch in about 4 days. The Provo River in Utah County is critical habitat for the endangered June sucker (UDWR 2000h), but because of downstream diversions, this species does not occur within the Project Area.

Land Use

Descriptions of existing land use within the Project Area were derived from the *Wasatch County General Plan* (Wasatch County 2001). This plan provides information related to land use trends, land use plans, zoning, land ownership, and profiles of the various communities potentially affected by the proposed Project. Current land use immediately adjacent to the US-189 corridor in the Wildwood to Deer Creek Park Segment is split between the categories of Watershed Conservation, Recreational Forest, and Grazing (Wasatch County 1999). Land ownership within the segment is held by a mixture of both public and private owners. Public ownership includes: the U.S. Department of Agriculture, National Forest Service (Forest Service); UDOT; and the U.S. Department of the Interior, Bureau of Reclamation (BOR). The Surface Management Responsibilities Map (Appendix F) provides a graphical display of current land management in

Wasatch County. Construction of a few recreation and second homes has occurred within the segment.

Very little additional growth would result from the Project because of limited private ownership, physical constraints, and restrictive zoning ordinances. With the exception of the Canyon Meadows development, no growth plans for the highway corridor are in place, and none are expected because nearly all private property in the canyon is already developed to the extent possible. Approximately twenty-six year-round residences have been constructed in the Canyon Meadows development. A total of eighty-four lots are platted in the development, but the County, the Canyon Meadows Homeowners Association, and the previous developer are involved in a variety of litigation with regard to building permits and previous development constraints. No new private property has or will become available and there are no plans to create growth-supporting infrastructure within the corridor. In addition, the existing physical constraints along the corridor (mountainous terrain, steep slopes, and adjacent river and railroad) effectively preclude nearly all further development.

Wasatch County General Plan

The *Wasatch County General Plan* (Wasatch County 2001) was updated and adopted in 2001 and implemented by the Wasatch County Planning, Zoning, and Development Code (adopted in October 2002). The plan divides the County into a number of Planning Areas, each with distinct land use restrictions and associated zoning. The plan designates the Project Area as part of the South Hills Planning Area. Land uses in this area currently consist of livestock grazing, a residential subdivision (Canyon Meadows), wildlife habitat, gravel extraction, and recreational facilities. The plan states that the South Hills Planning Area land uses should be limited to watershed protection, livestock grazing, and wildlife habitat. Further, the plan states that “this planning area should be designated as a preservation area designed to preserve the quality of the natural environment and effectively discourage summer home development on lots of less than 64.8 hectares (160.0 acres), recreational resorts, or other similarly incompatible developments or uses.” Copies of the *Wasatch County General Plan* are available from the Wasatch County Planning Commission.

In 2002, Wasatch County adopted a new land use zone known as P-160 (Preservation), which will allow only one residence per 64.8 hectares (160.0 acres) and limit development because of remoteness of services, topography, and other sensitive environmental issues. A copy of the P-160 zoning ordinance is included in Appendix F. Permitted principal uses are single-family dwelling, highway and street rights-of-way, irrigation distribution channels, water pressure control stations and pumping plants, other water utilities or irrigation, underground sewage pipeline right-of-way, historic and monument sites, range land, fallow, and forestry activities and related services. Much of the County, including the entire area of the highway corridor, has been zoned P-160 (see Zoning Map, Appendix F), which does not allow large-scale developments.

Other portions of Wasatch County are subject to considerable developmental and growth pressure due to the close vicinity of Summit County and the Park City area immediately to the north of the County. In addition to the relatively restrictive Mountain Zone (also a base density of one single family dwelling per 160 acres, but allowing large-scale development at that density) in these areas,

proposed developments are further constrained by the use of overlay zones with additional restrictions and a no-tolerance stance against any type of environmental degradation. Overlay zones establish a conditional use process for developments on a scale larger than the base density of the underlying Mountain Zone, subject to the further restrictions of the specific overlay land use plan and a physical constraints analysis. As a result, development in the County is highly controlled and any potential environmental impacts are very closely regulated and mitigated. The code for an example overlay zone, its permitted uses, and restrictions is included in Appendix F.

The two major overlay zones in the County are the Jordanelle Basin Overlay Zone (JBOZ) surrounding Jordanelle Reservoir and the North Village Overlay Zone (NVOZ) immediately north of Heber City on U.S. Highway 40 (US-40) (see Wasatch County Zoning Map, Appendix F). The potential build-out of the JBOZ is about 18,000 persons or about 7,000 units, while the NVOZ has a potential build-out of about 4,000 units. According to the Wasatch County Planning Office, build-out for these overlay zones has just started and may take over 20 years, depending upon the economy.

The proximity of the Project Area to major population centers, the abundant and diverse recreation opportunities that are offered in the area, the sub-alpine climate, and the outstanding scenery have all contributed to the establishment of the Project Area as a recreation center of regional significance (Shapiro 1989b). Provo Canyon's prominence in this regard was further solidified by its designation as a State Scenic Byway in 1990 and local support for its establishment as a National Scenic Byway. Growth within the Wasatch County area also reflects this growing recreation/tourist orientation.

Provo Canyon Scenic Byway Corridor and Watershed Management Plan

In an effort to protect the resources of Provo Canyon from conflicting needs, the Mountainland Association of Governments (MAG) facilitated preparation of the *Provo Canyon Scenic Byway Corridor Watershed Management Plan* (BIO-WEST et al. 2001).

Corridor Management Plan

A Corridor Management Plan is a prerequisite for applying for National Scenic Byway designation. This document describes how local property owners, communities, and agencies can guide the byway over time with dual objectives of protection and promotion. The purpose of this plan was to assess byway's potential to accommodate increased tourism levels within a clearly defined and realistic framework while protecting natural, scenic, historic, cultural, and recreational resources along the byway. The potential for the byway to achieve national designation, thereby maximizing the economic impacts, was also considered in the plan.

The Corridor Management Plan provided an overview inventory of resources, land use criteria and management prescriptions, and current and potential future uses for Provo Canyon. Within these constraints, the plan also evaluated the proposed improvements to US-189 in Provo Canyon in order to assure that such improvements would not jeopardize the potential designation of Provo Canyon Highway as a National Scenic Byway. The plan did not evaluate either the 1989 SEIS or the 2002 Preferred Alignment. General aspects of proposed highway improvements that were reviewed in

the plan included current and planned road layout, safety and design, incident management, seasonal parameters such as snowfall and flooding, commercial truck traffic, pedestrian and bicycle uses, roadway geometry and traffic patterns, and scenic driving experiences.

Watershed Management Plan

The purpose of this plan was to describe existing water resource conditions, identify specific water quality problems, and outline how watershed stakeholders plan to protect and restore water resources to the desired condition.

Stakeholders signed a Memorandum of Understanding and/or Interlocal Agreement indicating that they will continue to develop and implement the recreational and educational programs and facilities, as well as the restoration, rehabilitation, and protection programs, as stated in the plan. It should be noted that the document was developed for planning purposes and is not legally binding. Copies of the plan are available from the MAG in Orem, Utah.

Visual Resources

Basic information describing the existing visual environment within the Provo River drainage was reported in a previously published technical report for the overall Project (Shapiro 1989c). This report provided information related to the existing visual conditions within the upper and lower Provo Canyon areas and the anticipated consequences resulting from implementation of the 1989 SEIS Alignment. The current Project Area, which extends from the Wasatch County line near Wildwood to Deer Creek State Park, falls entirely within the upper Provo Canyon area. A summary of the existing Project Area visual conditions is provided below.

The Provo Canyon Project Area lies within the Middle Rocky Mountains geographical province as defined by Fenneman (1931). The Project Area is located within a visually confining canyon, along the lower reach of the Provo River, before it terminates at Utah Lake. The landscape has primarily been shaped by the downcutting of the Provo River and seismic activity. Elevations of the Project Area range from 1,600 meters (5,200 feet) above sea level at Wildwood to 1,700 meters (5,550 feet) above sea level at the entrance to Deer Creek State Park.

Historically, the canyon bottom contains a majority of the developable land. Apparent human-made features include the existing highway; residential development associated with the Wildwood community, the Canyon Meadows community, the BOR housing at Weeks Bench, other seasonal homes, and Deer Creek Campground; the Heber Valley Historical Railroad (HVHR); Deer Creek State Park; numerous access roads; and the Deer Creek dam, reservoir, and powerhouse. The landscape within the Project Area is dominated by steep mountains that rise abruptly from the canyon floor. These mountains consist of a variety of vegetation types, in addition to rock outcrops and talus slopes. Visible areas, those areas viewed from the highway, Provo River, and/or the HVHR, within the canyon are limited but at times may extend for several miles up or down canyon below Deer Creek Dam and Reservoir. The Canyon Meadows community offers distant views of the lower canyon and nearby views of the area below Deer Creek Dam. Above Deer Creek Dam

the visible areas from the highway and the reservoir expand to include distant views of the Heber Valley.

Recreation Resources

Recreational opportunities within and adjacent to Provo Canyon are an important lifestyle component for people who live in nearby communities; these opportunities serve as a major recreational draw for thousands of out-of-state visitors every year. Activities include fishing/hunting; hiking; road and mountain biking; downhill, back-country, and cross-country skiing; camping/picnicking; rafting, kayaking, and canoeing the Provo River; and wildlife viewing. In addition to boating and water skiing, similar opportunities occur within Deer Creek State Park. Because of the high value associated with such activities, as well as good recreational access, recreation also plays a vital part in the local economy. Below is a brief discussion of the major recreational opportunities present in the Project Area.

Developed Recreation Facilities

Heber Valley Historical Railroad (HVHR)

This small, privately operated, scenic railroad is an original steam engine-powered rail line and a popular tourist attraction for Provo Canyon and the surrounding area. The line begins in Heber City, extends southward around the northwestern shoreline of Deer Creek Reservoir, continues through the upper portion of Provo Canyon, and terminates at Vivian Park. The railroad dates back to 1899 and currently consists of two 1907 Baldwin steam locomotives and three vintage diesel electric locomotives. Ridership on the rail line is increasing every year and currently exceeds 60,000 riders annually. Because of the historic qualities of the HVHR and the scenic backdrop of Provo Canyon, the railroad has been used in several motion pictures and television programs (Heber Valley Railroad 2000).

The right-of-way (ROW) for the HVHR from Bridal Veil Falls (in lower Provo Canyon) to Deer Creek Dam belongs to UDOT, while the segment from Deer Creek Dam to Heber City belongs to the Utah Department of Natural Resources, Division of Parks and Recreation (State Parks).

Provo-Jordan River Parkway Trail (Trail)

The Provo-Jordan River Parkway Trail (Trail) was established in 1973, with the original intent of connecting the headwaters of the Provo River in the Uinta Mountains to the mouth of the Jordan River at the Great Salt Lake. When complete, the non-motorized recreation Trail system will be 217 kilometers (135 miles) long and paved in most areas. Much of the necessary Trail-development work along the Jordan River in the Salt Lake Valley has been completed or is in progress. Utah County has been actively coordinating the Trail system along the Provo River, and the paved Trail has been completed from Utah Lake to Vivian Park in Provo Canyon. There are existing informal trails on and adjacent to the rail line below the dam that are used by fishermen and hikers (Green 2001).

Utah County is currently widening the existing paved Trail between the mouth of Provo Canyon and Vivian Park (Susov 2001a, 2001b, 2002), and UDOT is in the process of transferring ownership of the ROW in this area to the county. In addition, as noted in Chapter 2 of this document, UDOT intends to extend the Trail to the vicinity of Deer Creek Dam as a part of the Wildwood to Deer Creek State Park project. Planning is also currently underway to extend the Trail around the western side of Deer Creek Reservoir and into Midway. State Parks would like to develop another Trail alignment across Deer Creek Dam and link it to a peripheral alignment on the southeastern side of the reservoir for access to Deer Creek State Park (Green 2001) in accordance with the regional trail vision shown in Figure 3-1. It should be noted that any trail construction proposed on or across Deer Creek Dam would require a modification to the *Deer Creek Reservoir Resource Management Plan* (Bear West 1998).

Pedestrian and Bicycle Facilities

Pedestrians and bicyclists currently use the Trail from the canyon mouth to Vivian Park in Provo Canyon. From Vivian Park up canyon, bicyclists use the highway shoulders.

Deer Creek State Park

Deer Creek State Park (formerly known as Deer Creek State Recreation Area) encompasses approximately 1,214 hectares (3,000 acres), surrounding and including Deer Creek Reservoir. All land associated with the Park and the reservoir is owned by BOR, while management of the Park and all recreation opportunities are provided for by an agreement between BOR and State Parks. In addition, management of the fishery within Deer Creek Reservoir is provided for by an agreement between BOR and UDWR. US-189 is the main mode of access to the area for park users from Provo, Heber City, and beyond. Deer Creek Reservoir impounds the Provo River, extending approximately 2.4 kilometers (6.0 miles) up-river from the Deer Creek Dam. There are 12 separate management areas within the Deer Creek State Park (Bear West 1998), each under its own management guidelines to provide different recreation opportunities and experiences. Visitation to Deer Creek Reservoir varies from year to year, with a peak of nearly 500,000 in 1980 to a low of under 200,000 in 1993. Regardless, Deer Creek State Park and Reservoir are a popular recreation destination.

Deer Creek Campground

Deer Creek Campground is a small, privately owned and operated campground located in the upper portion of Provo Canyon, just below the Deer Creek Dam facilities complex and between the current highway alignment and the Provo River. Facilities are provided for both recreational vehicle and tent camping, fishing, and picnicking.

Unimproved Recreation Facilities

As the lower segment of Provo Canyon from the canyon mouth to Wildwood is known for its many developed and improved recreation facilities, the upper portion of the canyon remains largely undeveloped except for the Deer Creek Campground (described above). Numerous unimproved recreation areas exist throughout the canyon and around Deer Creek Reservoir. Many of these exist in the form of turnouts to enable motorists and bicyclists to park off the side of the existing highway.

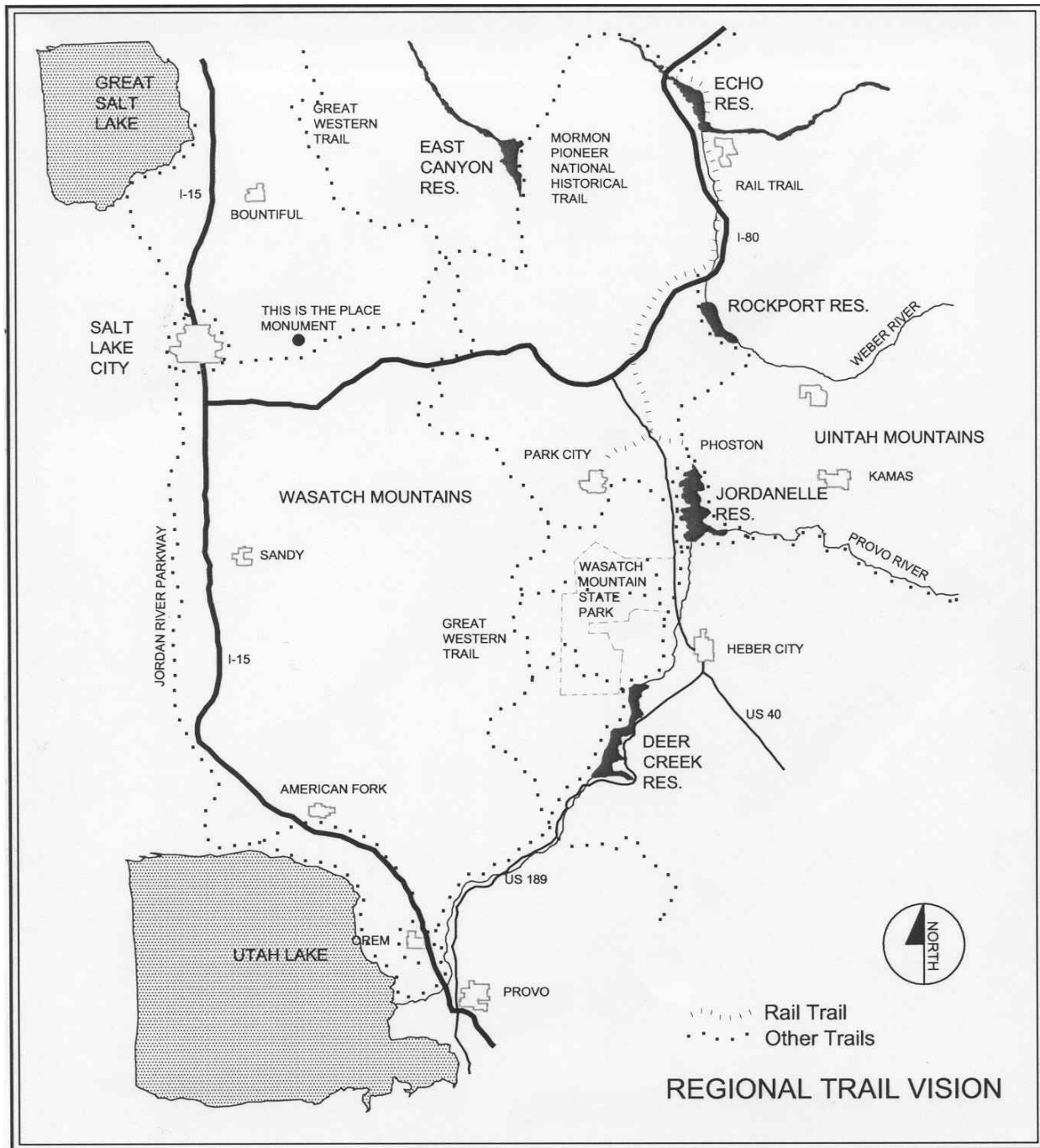


Figure 3-1. Vision of the Provo-Jordan River Parkway and Regional Trail System.

These turnouts and non-restricted access to the Provo River provide access for fishing, hiking, kayaking, and canoeing. Access is also largely non-restricted to adjacent parcels of Forest Service and BOR lands.

Adjacent Recreational Opportunities

Outside of and adjacent to the Project Area, Wasatch Mountain State Park is located immediately north of Deer Creek Reservoir and is accessible via US-189 and Utah State Route 113. This park is a popular destination for hiking, picnicking, golfing, cross-county skiing, snowmobiling, and sightseeing. Other recreation destinations via US-189 include numerous access points to Uinta National Forest lands, the Mount Timpanogos Wilderness Area, and Sundance Ski Resort via Utah State Route 92.

Socio-economics

Socio-economics include the existing social structure and/or the existing economic structure of the communities within the Project Area. A summary of existing socio-economic conditions in the Project Area for both Utah and Wasatch Counties is provided below.

The population of Utah County grew from 265,766 in 1990 to 371,894 in 2000, a 40 percent increase (GOPB 2002). The county's population is expected to increase to 559,907 by 2020. Total nonagricultural employment rose from 93,933 in 1990 to 152,699 in 2000. The largest sector of county-wide employment in 2000 was the services industry at 40 percent. This was followed by trade at 22 percent and government at 13.5 percent. Per capita personal income rose from \$12,043 in 1990 to \$18,793 in 1999. Ethnicity for Utah County is provided in Table 3-5.

Wasatch County grew from 10,134 in 1990 to 15,433 in 2000, a 52 percent increase, and is expected to increase to 24,806 by 2020 (GOPB 2002). Total nonagricultural employment rose from 2,534 in 1990 to 4,695 in 2000. The largest sector of county-wide employment in 2000 was the trade industry at 28.2 percent. This was followed by services at 24.3 percent and government at 21.5 percent. Per capita personal income rose from \$13,340 in 1990 to \$22,643 in 1999. Ethnicity for Wasatch County is provided in Table 3-6.

Within the Project Area, most employment opportunities are service-oriented and associated with the area's tourist and recreational opportunities. These service-oriented positions offer seasonal employment and are staffed primarily by government employees. Concessionaires in Deer Creek State Park also provide seasonal service employment (Shapiro 1989d). Specific places of employment within the Project Area include Deer Creek Dam power house, Deer Creek Campground, and Deer Creek State Park. The Deer Creek Campground is the only commercial establishment within the current Project segment. Regional and interstate commerce occurs through Provo Canyon.

Table 3-5. Ethnic Composition of Utah County.

RACE	PERCENT OF TOTAL ^a
American Indian or Alaska Native	0.6
Asian	1.1
Black or African American	0.3
Hispanic	7.0
Native Hawaiian or Other Pacific Islander	0.6
Other	3.2
White	92.4

Source: GOPB (2002).

^a Percentages may total more than 100 percent because of some individuals reporting more than one race.

Table 3-6. Ethnic Composition of Wasatch County.

RACE	PERCENT OF TOTAL ^a
White	95.6
Black or African American	0.2
American Indian or Alaska Native	0.4
Asian	0.3
Native Hawaiian or Other Pacific Islander	0.1
Hispanic	5.1
Other	2.0

Source: GOPB (2002).

^a Percentages may total more than 100 percent because of some individuals reporting more than one race.

Individual residences potentially affected by the 2002 Preferred Alignment include those associated with the area near the entrance to Canyon Meadows, the Canyon Meadows community itself, some seasonal homes east of the Provo River below Deer Creek Dam, and the Dam Tender's homes at Weeks Bench. Currently, the residences located near the entrance to Canyon Meadows are in proximity to the existing highway. Residents who live in the Canyon Meadows community currently do not have a view of the existing highway facility, although noise generated from the highway is audible. Seasonal residences along the east side of Provo River are somewhat separated from the existing highway while residences in the Weeks Bench area are located adjacent to and below the existing highway.

Environmental Justice

Executive Order 12898 states in part that Federal agencies shall identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs and activities on minority populations and low-income populations. Compliance with Executive Order 12898 on Federally funded transportation projects is further mandated by the U.S. Department of Transportation's *Order to Address Environmental Justice in Minority Populations and Low-Income Populations*, dated April 15, 1997, and by the FHWA's *Order FHWA Actions to Address*

Environmental Justice in Minority Populations and Low-Income Populations, dated December 2, 1998. Executive Order 12898 also mandates that according to Title VI of the Civil Rights Act of 1964, each Federal agency shall ensure that all programs or activities receiving Federal financial assistance that affect human health or the environment do not directly, or through contractual or other arrangements, use criteria, methods, or practices that discriminate on the basis of race, color, or national origin.

The Canyon Meadows subdivision represents the only sizable population in the Project Area. Information gathered at the block level during the 2000 census indicated that no minority owner-occupied households were present in the census blocks associated with the Canyon Meadows subdivision. Two minority renter-occupied households were present in an adjacent housing area when the 2000 census was conducted.

Cultural Resources

Numerous technical reports describing the historic, archaeological, and paleontological resources within the Project Area have been published (Norman and Merrill 1983; BYUOPA 1985, 1987, 1988, 1989, 1995; Weymouth et al. 1995; Reed 2001). A brief summary of the historic, archaeological, and paleontological sites potentially affected by the proposed Project is provided below.

No paleontological resources of note have been found within the Project Area (BYUOPA 1995). Twenty separate historic or archaeological sites were recorded within the Wildwood to Deer Creek State Segment. These 20 sites are listed in Table 3-7. The Utah Department of Transportation determined that 12 of these 20 properties are eligible for the National Register of Historic Places (NRHP) as defined by 36 CFR 60.4, and the remaining eight properties are ineligible for the NRHP (BYUOPA 1989, Southworth 1995, Skinner 2000). Each property's eligibility is also identified in Table 3-7.

Noise

The unit of measurement used in sound measurement is the decibel (dB), a logarithmic unit that expresses the ratio of the sound pressure level being measured to a standard reference level. For monitoring and analyzing traffic and other environmental noise sources, the dB is "weighted," or put on the A-weighted scale. The A-weighted scaling (dBA) more closely represents the response of the human ear to sound by reducing the measured sound pressure from low-frequency sounds and by slightly increasing the measured sound pressure from some high-frequency sounds. Typical A-weighted sound levels are depicted in Figure 3-2. One of the more common descriptors used to characterize fluctuating noise levels is called the Equivalent Sound Level (Leq). The Leq sound level is the steady A-weighted sound energy that would produce the same A-weighted sound energy over the same given period of time as the specified time-varying sound. For traffic noise studies, Leq is usually evaluated over a 1-hour time period and is therefore denoted as Leq(h).

Table 3-7. Eligibility of Historic and Prehistoric Sites Recorded in the Wildwood to Deer Creek State Park Segment.

SITE NUMBER AND NAME	SITE TYPE	ELIGIBILITY	ELIGIBILITY REFERENCE
42SU136: Henefer Bridge	Historic	Not Eligible	BYUOPA 1989
42WA88: Powder magazine	Historic	Not Eligible	Southworth 1995
42WA42: Campsite	Prehistoric	Eligible	Skinner 2000
42WA86: Lithic scatter	Prehistoric	Not Eligible	BYUOPA 1989
42WA85: Lithic scatter	Prehistoric	Not Eligible	BYUOPA 1989
42WA40: Structure foundation	Historic	Not Eligible	Southworth 1995
42WA41: Possible campsite	Prehistoric	Not Eligible	BYUOPA 1989
42WA87: Weeks Bench Archaeological Site	Prehistoric	Eligible	Southworth 1995
42WA113: Fisherman's Bridge	Historic	Eligible	BYUOPA 1989
42WA114: Heber Valley Historical Railroad (HVHR) Overpass	Historic	Eligible	Southworth 1995
42WA112: Heber Valley Historical Railroad (HVHR)	Historic	Eligible ^a	Southworth 1995
DC6: Deer Creek Reservoir Dam Complex	Historic	Eligible	Southworth 1995
42WA177: Deer Creek Dam Government Construction Camp	Historic	Not Eligible	Southworth 1995
DC4: Deer Creek Culvert	Historic	Not Eligible	Southworth 1995
DC5: Provo River Timber Stringer Bridge	Historic	Eligible	Southworth 1995
BLDG-1: Residence	Historic	Eligible	Southworth 1995
BLDG-2: Residence	Historic	Eligible	Southworth 1995
BLDG-3: Residence	Historic	Eligible	Southworth 1995
BLDG-4: Residence	Historic	Eligible	Southworth 1995
BLDG-5: Residence	Historic	Eligible	Southworth 1995

^a The eligible segment of the HVHR is located between roadway station 18+000 (Wildwood) and 22+500 (immediately down-canyon from the historic railroad overpass).

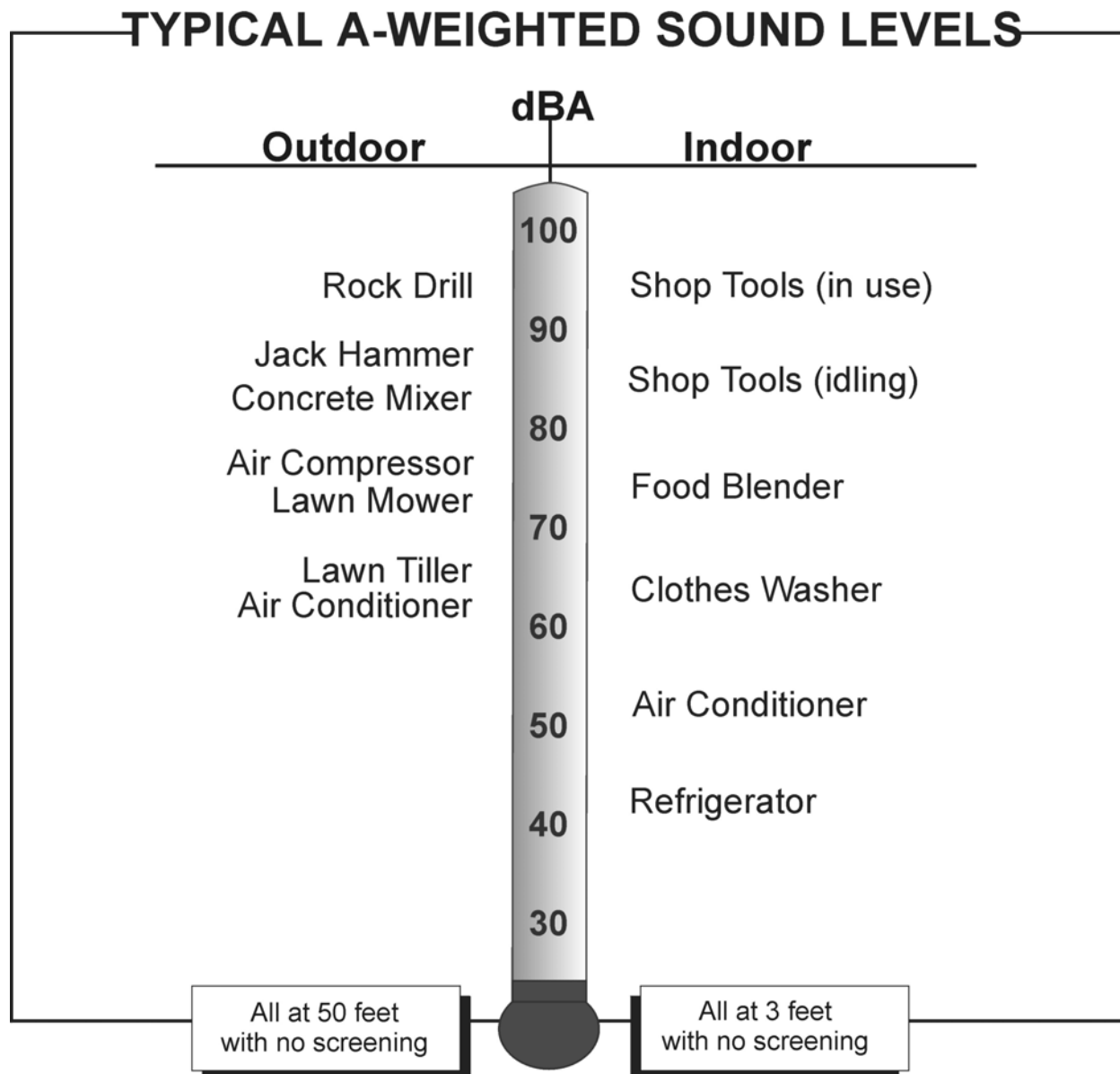


Figure 3-2. Typical Indoor and Outdoor A-weighted Sound Levels without Screening.

Regulatory Criteria

Under the Federal Noise Control Act of 1972 (EPA, 40 CFR 201 to 211), all Federal agencies are required to implement programs promoting environments free from noises that potentially jeopardize public health or welfare. Criteria has been developed and adopted by the FHWA for evaluating potential noise impacts for Federally funded highway projects and determining if such impacts justify mitigation (23 CFR Part 772). This criteria is known as the FHWA Noise Abatement Criteria (NAC) and is shown in Table 3-8. A similar and consistent policy has been adopted by UDOT, known as the UDOT Noise Abatement Policy (08-111, Revised 4/18/92, and 08A2-1, 1995, 2000).

Table 3-8. Federal Highway Administration (FHWA) Noise Abatement Criteria (NAC).

ACTIVITY CATEGORY	LEQ(h)	DESCRIPTION OF ACTIVITY CATEGORY
A	57 dBA ^a (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 dBA (exterior)	Picnic areas, fixed recreation areas, playgrounds, active grounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 dBA (exterior)	Cemeteries, commercial areas, industrial areas, office buildings, and other developed lands, properties, or activities not included in Activity Categories A or B.
D	No limit	Undeveloped lands, including roadside facilities and dispersed recreation.
E	52 dBA (interior)	Motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums. (The interior criterion only applies when there are no exterior activities to be affected by traffic noise.)

^a Decibel on the A-weighted scale.

According to the NAC, this segment of US-189 falls in Category B. Therefore, a traffic noise impact would occur if:

- the predicted design-year traffic noise Leq(h) approaches (is within 2 dBA of [65 dBA]) or exceeds the NAC (67 dBA), or
- the predicted design-year traffic noise Leq(h) substantially exceeds (by 10 or more dBA) the existing Leq.

Existing Noise Levels

Dominant noise sources within the Project Area include passenger vehicles and large truck traffic on the existing highway, the HVHR, jet aircraft, outdoor recreational vehicles and other recreational activities, dam-related noise such as spillway and power house operation, and residential activities such as lawn mowing and children playing. Sensitive receivers within the Project Area include existing home/cabin sites and platted lots in and near the Canyon Meadows development, seasonal homes along the east side of the Provo River in the vicinity of Deer Creek Campground, and residences within the Weeks Bench area, which is a BOR housing development for the dam tenders.

As part of the 1995 Re-evaluation of the SEIS, a noise study was performed in accordance with 23 CFR Part 772 (published in Volume 47, No. 131 of the *Federal Register*) and UDOT Noise Abatement. The existing noise levels were measured on site in June 1994 with a Type II sound level meter. An updated noise study was conducted at these same locations during July 2001 using a laboratory-certified Quest Technologies —26 dosimeter. Results indicate that there are no sensitive receivers associated with residences where existing dBA readings are 65 or greater (Table 3-9). The receiver location on Deer Creek Dam showed a reading of 66.2. There are no residences within this area, however.

Air Quality

National Ambient Air Quality Standards (NAAQSs) comprise primary standards to protect public health and secondary standards to safeguard public welfare from effects such as pollution damage to property and vegetation. These standards, set by the EPA, have also been established as the official standards for the State of Utah. Under direction of the Clean Air Act Amendments of 1990, NAAQSs have been established for six different pollutants. These six “criteria pollutants” are lead (Pb), ozone (O₃), sulfur dioxide (SO₂), oxides of nitrogen (NO_x), carbon monoxide (CO), and particulate matter smaller than 10 microns in diameter (PM₁₀). Based on air quality monitoring data, Wasatch County is classified as an attainment area by the Utah Department of Environmental Quality, Division of Air Quality. This means that the region is in compliance with the NAAQS for these six criteria pollutants.

According to the most recent traffic analysis for Provo Canyon (Fehr & Peers 2000), the average annual daily traffic (AADT) levels are much higher today than those predicted in the 1978 EIS (FHWA 1978) and 1989 SEIS (FHWA 1989a). Furthermore, the predicted AADT of 10,863 for the original design year of 2010 has almost been surpassed by 2000 traffic counts. These traffic counts appear to be directly tied to the population growth for Utah and Wasatch Counties, which have nearly doubled since the 1978 EIS was completed (FHWA 1978). Current population and employment forecasts for both counties show an annual growth rate between 2.2 and 4.4 percent. With such steady growth, AADT levels are predicted to be somewhere between 16,238 and 20,792 in 2020 (the new designated design year). This growth in traffic rates may present challenges for Wasatch County to maintain its current attainment status.

Utah County expects final air quality conformity in April 2003.

Truck Access

US-189 is classified as a Federal Aid Principal Arterial on the National Highway System and is included on the National Network for Trucks. The Principal Arterial classification is the highest order of roads of national significance (Miller 2001, pers. comm.).

Table 3-9. Existing Noise Levels, Provo Canyon, July 2001.

SITE RECEIVER NO.	DURATION	CARS/ LIGHT TRUCKS ^a	MEDIUM TRUCKS ^a	HEAVY TRUCKS ^a	EXISTING LEQ ^b	EQUAL TO OR GREATER THAN 65 dBA ^c	COMMENTS
1. Dam	15 minutes	468	8	76	66.2	Yes	Highway traffic and the HVHR ^d are the dominant noise sources.
2. BOR ^e Housing	15 minutes	604	20	40	47.2	No	Highway traffic is the dominant noise source.
3. Berm by BOR Housing	15 minutes	364	20	36	61.5	No	Highway traffic is the dominant noise source.
4. Campsite below Dam	15 minutes	492	20	40	52.7	No	Highway traffic is the dominant noise source.
5. Deer Creek Camp-Ground	10 minutes	588	19	34	53.4	No	Highway traffic is the dominant noise source.
6. Canyon Meadows Office	15 minutes	563	18	37	56.6	No	The receiver is too far from the highway. These noise levels are from two passing dump trucks.
7. Hoover Housing Residences by Highway	15 minutes	568	16	48	61.3	No	Highway traffic is the dominant noise source.

^a Hourly counts extrapolated from 15-minute counts.^b Equivalent sound level.^c Decibel on the A-weighted scale.^d Heber Valley Historical Railroad (HVHR).^e U.S. Department of the Interior, Bureau of Reclamation.

The route and classification of US-189 is protected under 23 CFR 658.11 that states:

Sec. 658.11 Additions, deletions, exceptions, and restrictions

To ensure that the National Network remains substantially intact, FHWA retains the authority to rule upon all requested additions to and deletions from the National Network as well as requests for the imposition of certain restrictions. FHWA approval or disapproval will constitute the final decision of the U.S. Department of Transportation.

Currently, oversize and overweight trucks are restricted from US-189 in Provo Canyon. This includes long combination vehicles. Vehicles carrying hazardous materials are not restricted at this time (Clasby 2001, pers. comm.).

HIGHWAY RECONSTRUCTION: DEER CREEK STATE PARK TO HEBER CITY

Descriptions of the pertinent physical, biological, and social resources within the Deer Creek State Park to Heber City Segment of US-189 are based on updated literature and file searches; contact and coordination with local, State, and Federal agencies and personnel; field visits by resource specialists; and review of the 1989 SEIS (FHWA 1989a), 1995 Re-evaluation of the 1989 SEIS (BIO-WEST, Inc. 1995), and the Deer Creek Reservoir Resource Management Plan (Bear West 1998). Existing conditions are discussed below for each potentially affected resource component. For the most part, resource characteristics are as described in the 1989 SEIS; consequently, the following descriptions are brief and are intended to highlight any changes since the 1989 analysis. Additional documentation pursuant to the National Environmental Policy Act may be warranted when plans for this portion of the Project are closer to being finalized and implemented.

Earth Resources

As described in the 1989 SEIS, US-189 crosses low rolling hills adjacent to Deer Creek Reservoir, transitions near Charleston to the flat floor of Heber Valley and continues along the valley bottom into Heber City (FHWA 1989a). Existing road cuts in the hills contribute to four rockfalls between Deer Creek Dam and Heber City (FHWA 1989a). No changes of significance in the resource has occurred since that documentation.

Water Resources

The Wildwood to Deer Creek State Park section of this chapter discusses the dramatic changes in the watershed since 1989 because of the Jordanelle Dam and Reservoir and describes the water quality standards the State of Utah applies to the Provo River and its tributaries. For the Deer Creek State Park to Heber City Segment; slope characteristics, vegetation composition, and general soil

types and their combined effects on surficial runoff and water quality remain as discussed in the 1989 SEIS (FHWA 1989a).

Vegetation and Wildlife

The 1989 SEIS describes the existing vegetation communities and their importance as wildlife habitat for the Deer Creek State Park to Heber City Segment of US-189 (FHWA 1989a). While vegetation and habitat conditions have not changed significantly since that time, coordination with the USFWS and the UDWR has continued to document concerns related to wildlife. In particular, the UDWR has expressed concern for potential impacts to big game related to existing elk and mule deer winter range above Deer Creek Reservoir (Pederson 2000).

Threatened, Endangered, and Candidate Species

Coordination with the USFWS regarding threatened, endangered, and candidate species has been ongoing as described previously. Discussion of these species and their potential for occurring in Wasatch and Utah Counties is discussed under the Wildwood to Deer Creek State Park Segment of this chapter.

Wetlands

Jurisdictional wetlands are described in the 1989 SEIS (FHWA 1989a), with one Section 404 wetland identified at the US-189 crossing of Main Creek. The 1989 SEIS also identifies an isolated wetland north of Island Bay. Additionally, US-189 crosses Daniel's Creek east of Charleston. BIO-WEST, Inc. conducted a brief field investigation of the isolated wetland in 2003 and verified that it does exist and may be regulated by the Corps. No wetlands are currently associated with the Daniels Creek crossing. Further coordination with the Corps will be required when funding for this project segment becomes available and additional environmental analysis and design is initiated.

Fisheries

As described in the 1989 SEIS (FHWA 1989a), Deer Creek Reservoir is a heavily-used, multi-species (largemouth bass [*Micropterus salmoides*], walleye [*Stizostedion vitreum*], yellow perch [*Perca flavescens*], and several trout species) fishery. Daniel's Creek remains unclassified by the UDWR with respect to habitat, while Main Creek is a Class 3 (i.e., High Priority) habitat, indicating that it is an "intensive use area that due to relatively wide distribution does not constitute critical values but which is highly important to high interest wildlife." Main Creek is habitat for rainbow, cutthroat, brook, and brown trout, as well as walleye, dace, and longnose.

Land Use

The regional land use characterization is discussed in the 1989 SEIS (FHWA 1989a) and was updated under the Wildwood to Deer Creek State Park Segment of this chapter. The hills on the eastern shore of Deer Creek Reservoir are Federally and State owned, and are managed for wildlife

(big-game) habitat and grazing (BOR 1998). US-189 is bordered by private property after it crosses the Charleston City limit and extends to Heber City (with the exception of the municipally-owned Heber City airport). Land between Charleston and Heber City remains in agricultural/grazing use with occasional residences as described in the 1989 SEIS (FHWA 1989a). According to the Wasatch County General Plan, the greatest constraint to additional development in this area is the poor suitability of soils for septic tank drainfields (Wasatch County Planning Commission 2001). In 1999, Charleston residents voted to not have sewer services extended into their community, which further limits the amount of development feasible along this section of US-189.

Visual Resources

The 1989 SEIS describes the visual environment in the Deer Creek Reservoir and Upper Provo Canyon areas (FHWA 1989a). Existing visual characteristics have not changed significantly since 1989.

Recreational Resources

The Recreation Resources section under the Wildwood to Deer Creek State Park Segment of this chapter and the 1989 SEIS describe the recreational resources in Heber Valley and Provo Canyon, including Deer Creek State Park, which was formerly known as Deer Creek State Recreation Area.

Socio-economic Resources

The discussion of Socio-Economic Resources under the Wildwood to Deer Creek State Park Segment of this chapter summarizes the existing socio-economic conditions in Wasatch County.

Cultural Resources

Previous investigations identified no impacts to historic or archeological resources of note as a result of the Project (BYUOPA 1987). There are three historic sites (two containing house remains and one comprised of lithic scatter) that would be potentially impacted by the highway improvements in the Deer Creek State Park to Heber City Segment of US-189, but none of these sites were determined to be eligible for the National Register of Historic Places.

Noise

The 1989 SEIS contains a noise evaluation using projected traffic counts available at the time which included monitoring and modeling noise at sites in Charleston, along US-189 near Island Bay, and in the hills above US-189 north of Wallsburg Junction (FHWA 1989a). Updated noise analyses related to US-189 improvements for the Deer Creek State Park to Heber City Segment will be conducted when a more detailed design is developed.

Air Quality

The discussion of Air Quality under the Wildwood to Deer Creek State Park Segment in this chapter describes the existing air quality regulations and conditions present in Wasatch County.

TRAIL EXTENSION

Descriptions of the pertinent physical, biological, and social resources within the current Project Area are based on literature and data file searches; contact and coordination with local, State, and Federal agencies and personnel; field visits by resource specialists; and review of the 1989 SEIS (FHWA 1989a), the 1994 Rail with Trail Feasibility Study (Bear West 1994), and the 1995 Re-evaluation (BIO-WEST 1995). Those conditions are discussed below under each potentially affected resource component. Because the Trail Vivian Park to Wildwood Extension (Trail Extension) (Figure 3-3) generally lies within the proposed highway corridor and much of the affected environment for the Trail Extension is identical to that for the highway reconstruction, the material included earlier under “Highway Reconstruction” will not be duplicated in this portion of the chapter.

Earth Resources

Earth Resources in and around the proposed Trail Extension area are identical to those previously described under Earth Resources in the Highway Reconstruction section of this document.

Water Resources

Water resources in and around the proposed Trail Extension area are identical to those previously described under Water Resources in the Highway Reconstruction section of this document.

Vegetation and Wildlife

Vegetation and Wildlife in and around the proposed Trail Extension area are identical to those previously described under Vegetation and Wildlife in the Highway Reconstruction section of this document.

Threatened, Endangered, and Candidate Species

Threatened and endangered species in and around the proposed Trail Extension are identical to those previously described under Threatened and Endangered Species in the Highway Reconstruction section of this document.

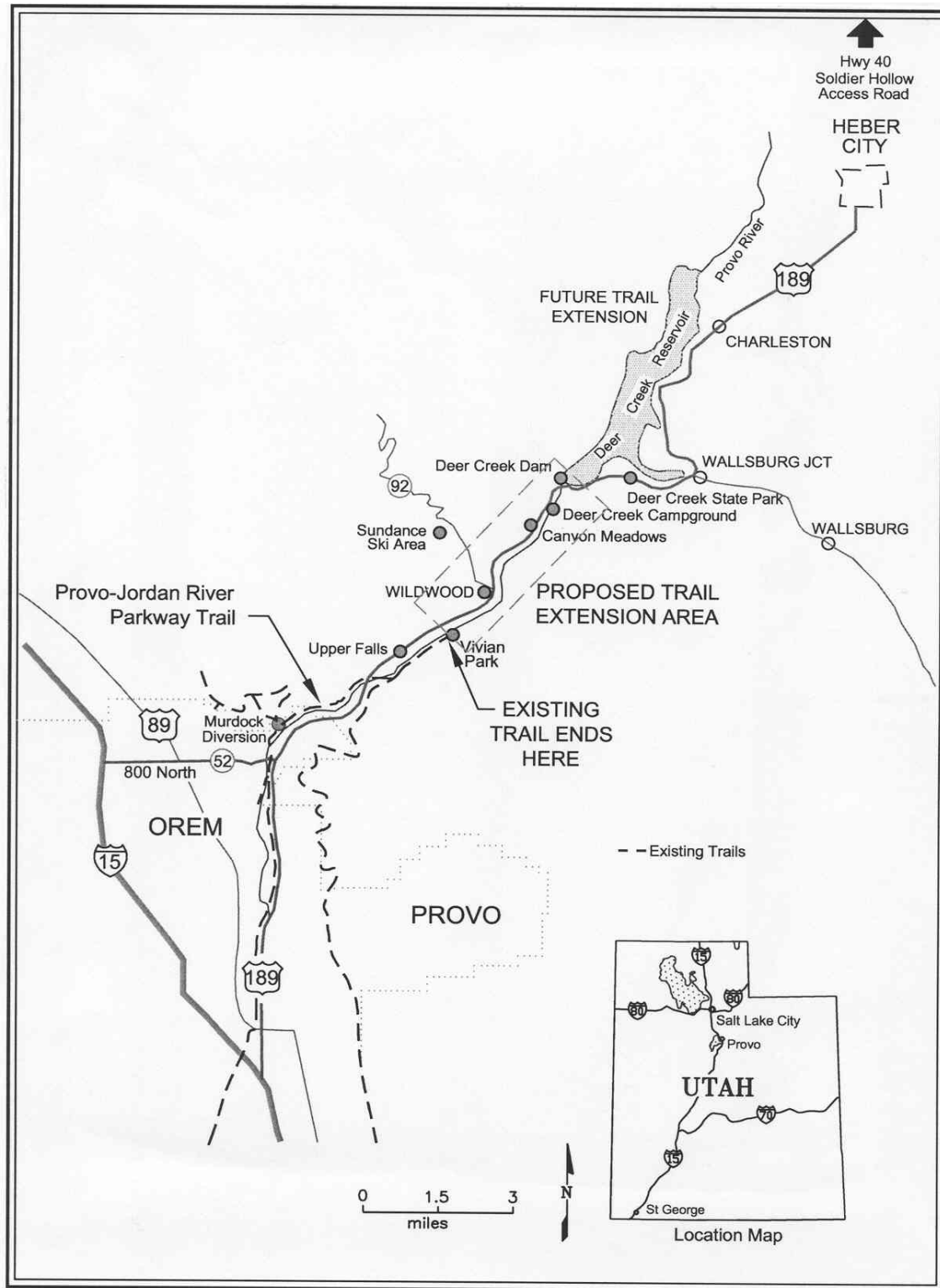


Figure 3-3. Proposed Extension of the Provo-Jordan River Parkway Trail from Vivian Park to Deer Creek Dam (Trail Extension).

Wetlands

Affected wetland resources in proximity to the Trail Extension have been divided into two categories and are discussed below.

Marginal/Riparian-wetlands

Because of the steepness of the banks and the flood cycle of the Provo River, these marginal/riparian-wetland areas are dominated by vegetation such as willow (*Salix* spp.) and red osier dogwood (*Cornus stolonifera*) that can withstand both occasional flooding and long periods of drought. These areas do not meet the Corps definition of regulated wetlands but are still important habitat.

Jurisdictional Wetlands

Wetlands are at or near the river elevation and extend further across the river's floodplain than riparian-wetland areas. Wetland areas are flooded more frequently and contain soils that retain moisture for longer durations. These wetlands are generally located in natural areas along the Provo River that have not been disturbed by fill in the floodplain. Dominant vegetation types in these areas are similar to the riparian wetlands, but they are more highly developed and typically contain a more diverse and dense vegetative community. These areas are regulated by the Corps.

Fisheries

Fisheries resources in and around the proposed Trail Extension are identical to those previously described under Fisheries Resources in the Highway Reconstruction section of this document.

Land Use

The Trail Extension would cross into Utah County. Utah County land-use maps show that the Trail corridor in this area is currently owned by State Parks, the Forest Service, and Utah County, with some unincorporated lands held privately.

Land uses in Wasatch County in and along the proposed Trail Extension are identical to those previously described under Land Use in the Highway Reconstruction section of this document.

Visual Resources

Visual resources in and around the proposed Trail Extension are identical to those previously described under Visual Resources in the Highway Reconstruction section of this document.

Recreational Resources

Existing recreational resources in and around the proposed Trail Extension are identical to those previously described under Recreational Resources in the Highway Reconstruction section of this document.

Socio-economic Resources

Socio-economic resources in and around the proposed Trail Extension are identical to those previously described under Socio-Economic Resources in the Highway Reconstruction section of this document.

Cultural Resources

Historic, archaeological, and paleontological resource descriptions for the Trail are based on inventories conducted by Sagebrush Archaeological Consultants (Weymouth et al. 1995), Brigham Young University's Office of Public Archaeology (BYUOPA 1995, 2001), and Alpine Archaeological Consultants (Reed 2001). Cultural Resources in and around the proposed Trail Extension area are described in Table 3-10.

Table 3-10. Properties in the General Vicinity and within the Area of Potential Effect (APE) of the Trail Extension.

SITE NUMBER AND NAME	WITHIN APE	SITE TYPE	ELIGIBILITY	ELIGIBILITY REFERENCE
42SU136: Henefer Bridge	No	Historic	Not Eligible	BYUOPA 1989
42UT157: Vivian Park Campsite	No	Historic	Undetermined ^a	BYUOPA 2001
42WA88: Powder magazine	No	Historic	Not Eligible	Southworth 1995
42WA86: Lithic scatter	No	Prehistoric	Not Eligible	BYUOPA 1989
42WA113: Fisherman's Bridge	Yes	Historic	Eligible	BYUOPA 1989
42WA112: Heber Valley Historical Railroad (HVHR)	Yes	Historic	Eligible ^b	Southworth 1995
DC6: Deer Creek Reservoir Dam Complex	Yes	Historic	Eligible	Southworth 1995
42WA177: Deer Creek Dam Government Construction Camp	No	Historic	Not Eligible	Southworth 1995
DC4: Deer Creek Culvert	No	Historic	Not Eligible	Southworth 1995
DC5: Provo River Timber Stringer Bridge	Yes	Historic	Eligible	Southworth 1995

^a The undetermined status of site 42UT157 is due to the fact that the site has been obliterated and is no longer able to be located. This site is the only site identified between Vivian Park and Wildwood.

^b The eligible segment of the HVHR is located between roadway station 18+000 (Wildwood) and 22+500 (immediately down-canyon from the historic railroad overpass).